Commodore's New 64C Computer

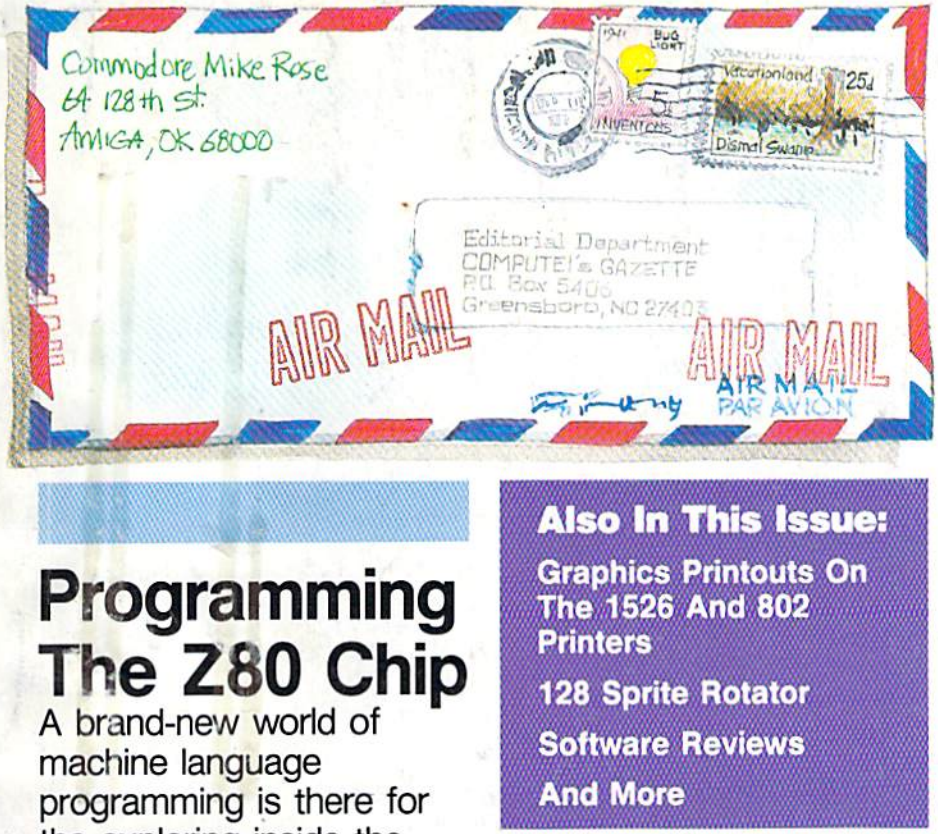
COMPUTE!'s GAZETTE

$3.00
August 1986
Issue 38, Vol. 4, No. 8
02220 $4.25 Canada

FOR **COMMODORE** PERSONAL COMPUTER USERS

The Complete TurboDisk: The 1541 Transformed

Commodore 128 and 64 versions plus two 64 support utilities—TurboDisk Relocator and Turbo Boot Maker


Commodore Mike Rose
64 128th St.
AMIGA, OK 68000
BUG LIGHT
INVENTORS
Vacationland 25¢
Dismal Swamp
Editorial Department
COMPUTE!'s GAZETTE
P.O. Box 5406
Greensboro, NC 27403
AIR MAIL
AIR MAIL
AIR MAIL
PAR AVION

Address Cataloger

Fast, versatile, and easy-to-use, this database for the 64 offers instant searches, quick sorts, and several printout formats.

Programming The Z80 Chip

A brand-new world of machine language programming is there for the exploring inside the Commodore 128. Get started with this thorough tutorial.

Also In This Issue:

- Graphics Printouts On The 1526 And 802 Printers
- 128 Sprite Rotator
- Software Reviews
- And More

An Introduction To Assemblers For The Commodore 64 And 128

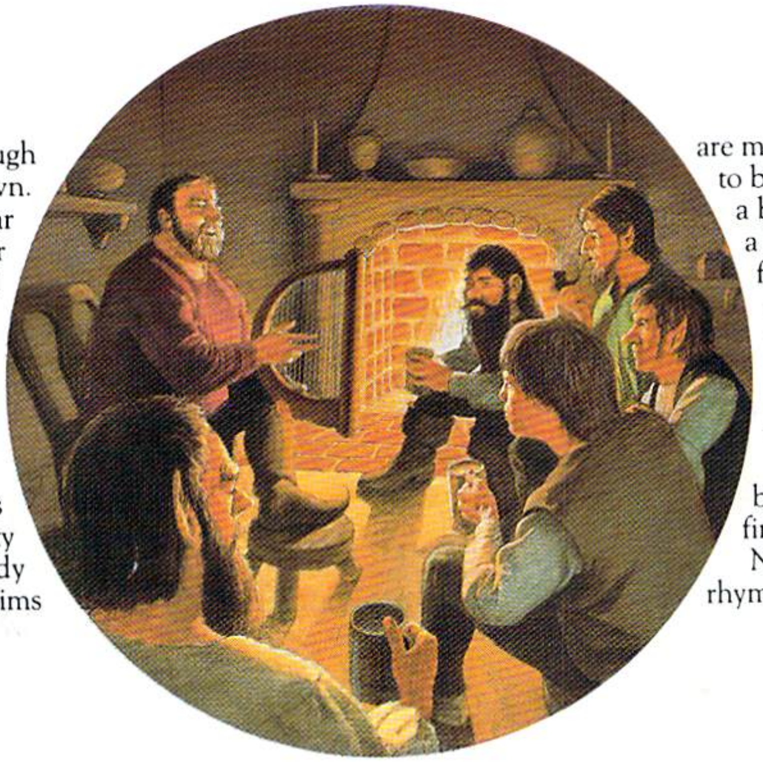
Planning to program in machine language? You'll need a good assembler—here's how to find the right one.

Slots

Match wits with a very intelligent opponent—your computer. An intriguing four-level strategy game for the Commodore 64, Plus/4, and 16.

(No I.D. required for half-elves.)

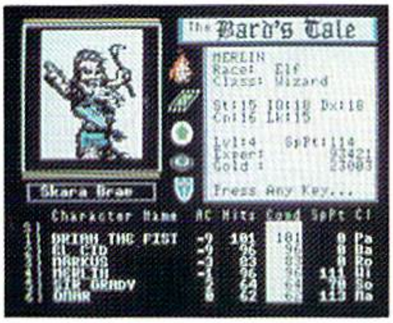
When the Going Gets Tough, the Bard Goes Drinking.



And the going is tough in Skara Brae town. The evil wizard Mangar has cast an eternal winter spell. Monsters control the streets and dungeons beneath. Good citizens fear for their lives. What's worse, there's only one tavern left that serves wine.

But the Bard knows no fear. With his trusty harp and a few rowdy minstrel songs he claims are magic, the Bard is ready to boogie. All he needs is a band of loyal followers: a light-fingered rogue to find secret doors, a couple of fighters to bash heads, a conjurer to create weird allies, a magician for magic armor.

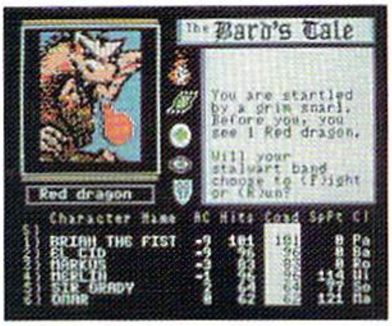
Then it's off to combat, as soon as the Bard finishes one more verse. Now what's a word that rhymes with "dead ogre?"



```
MERLIN
Race:  Elf
Class: Wizard

St:15 IQ:18 Dx:18
Cn:16 Lk:15

Lvl:4     SpPt:114
Exper:       93421
Gold :       23003

Press Any Key...
```

```
  Character Name   AC Hits Cond SpPt Cl
1 BRIAN THE FIST   -9  101  101    0 Pa
2 EL CID           -9   96   96    0 Ba
3 MARKUS           -3   83   83    0 Ro
4 MERLIN           -1   96   96  111 Wi
5 SIR GRADY         2   64   64   78 So
6 OMAR              0   62   62  113 Ma
```

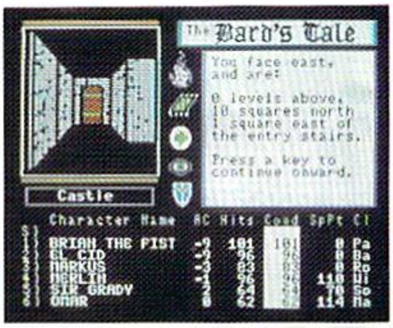
4 classes of magic user, including wizard and sorceror. 85 new magic spells in all.



```
You are startled
by a grim snarl.
Before you, you
see 1 Red dragon.

Will your
stalwart band
choose to (F)ight
or (R)un?
```

```
  Character Name   AC Hits Cond SpPt Cl
1 BRIAN THE FIST   -9  101  101    0 Pa
2 EL CID           -9   96   96    0 Ba
3 MARKUS           -3   83   83    0 Ro
4 MERLIN           -1   96   96  114 Wi
5 SIR GRADY         2   64   64   97 So
6 OMAR              0   62   62  121 Ma
```

128 color monsters, many animated. All challenging.



```
You face east,
and are:

0 levels above,
10 squares north
1 square east of
the entry stairs.

Press a key to
continue onward.
```

```
  Character Name   AC Hits Cond SpPt Cl
1 BRIAN THE FIST   -9  101  101    0 Pa
2 EL CID           -9   96   96    0 Ba
3 MARKUS           -3   83   83    0 Ro
4 MERLIN           -1   96   96  110 Wi
5 SIR GRADY         2   64   64   78 So
6 OMAR              0   62   62  114 Ma
```

Full-color scrolling dungeons. 16 levels, each better than the one before. 3-D city, too.

The Bard's Tale™

from

ELECTRONIC ARTS™

Specs: 100% machine language. 400K worth on 2 disks. 64K RAM minimum; enhanced for 128K. Now available for Apple II family for $44.95, C-64 & 128 for $39.95. **To order:** Visit your retailer or call (800) 245-4525 (In Calif. call (800) 562-1112) for VISA or MasterCard orders. To purchase by mail, send check or money order to Electronic Arts, P.O. Box 306, Half Moon Bay, CA 94109. Add $3 for insured shipping and handling. Allow 1-4 weeks for delivery. The Bard's Tale is worth the wait.

Apple is a trademark of Apple Computer. Wizardry is a registered trademark of Sir-Tech Software, Inc. Ultima is a registered trademark of Richard Garriott. The Bard's Tale and Electronic Arts are trademarks of Electronic Arts. For a copy of our complete catalogue and direct order form, send $.50 and a stamped, self-addressed envelope to Electronic Arts, 2755 Campus Drive, San Mateo CA 94403.

The Infinity Machine holds the secret of eternal life!

MASTERTRONIC
THE SLUGGER
MASTERTRONIC
FIVE-A-SIDE SOCCER
MASTERTRONIC
THE LAST V8
MASTERTRONIC

This could be the most exciting product for the C64 in 1986!

MAKES ALMOST IMPOSSIBLE ARCADE GAMES EASY TO MASTER . . .

An innovative 'hi tech' import that will shock some U.S. software publishers . . .

Q: What is the Infinity Machine?
A: ***A unique* and revolutionary accessory for the *Commodore 64 and 128.* This powerful cartridge now lets you effortlessly play all those impossible games without being killed!**
Q: Sounds difficult.
A: **It's Simple – Just plug into your C64/128 and press a button to activate the Infinity Shield.**
Q: How does it work?
A: **All the thousands of published action and animated games that use a programming device called "Sprite collision detection", are disabled by the Infinity Machine and the Infinity Shield protects the player from being shot or crashing!**
Q: What can I now do in a game that I couldn't before?
A: **Activating the cartridge enables you to:– "Enter a game at any level you choose". "Explore all the areas and levels of the game and find the parts of the game you didn't know existed without being killed." Deactivating the cartridge at any point you choose enables you to continue to play the game totally normally.**

The Infinity Machine is brought to you at $24.99 by Mastertronic, producers of incredible value Commodore 64/128K software such as Slugger, 5-a-side Soccer and The Last V8 all available at $9.99.

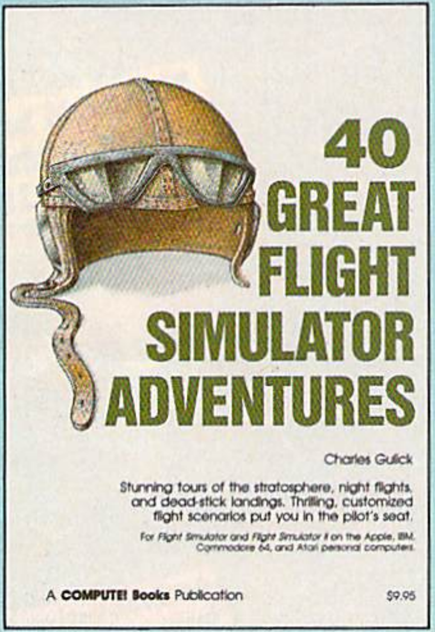
Contact the Mastertronic hot line for the secret of eternal life on 301-695 8877.
Mastertronic International Inc., 7311b Grove Road, Frederick, Maryland 21701

Discover the thrill of flying!

with COMPUTE! Books'

40 Great Flight Simulator Adventures

- Maneuver around the towers of the World Trade Center.
- Sightsee the Hudson River.
- Practice night flying and aerobatics.



40 GREAT FLIGHT SIMULATOR ADVENTURES
Charles Gulick
Stunning tours of the stratosphere, night flights, and dead-stick landings. Thrilling, customized flight scenarios put you in the pilot's seat.
For Flight Simulator and Flight Simulator II on the Apple, IBM, Commodore 64, and Atari personal computers.
A COMPUTE! Books Publication
$9.95

40 Great Flight Simulator Adventures
Charles Gulick
Forty exciting, customized flight simulator scenarios put you in the pilot's seat as you fly over bridges, around skyscrapers, and land at mysterious airports. *Flight Simulator* (IBM PC) and *Flight Simulator II* (Apple II, Commodore 64, Atari) are two of the most popular games/simulations for personal computers. With this book, you can experience flight adventures from the moment you load the program. Parameters set up each flight and a running commentary describes what you'll see (and where to look to see it). Ranging from the simple and straightforward to the advanced and even mystical, these 40 flights will open a new dimension to an already outstanding program.
$9.95 ISBN 0-87455-022-X

Note: *Flight Simulator* from Microsoft Corporation or *Flight Simulator II* from Sublogic Corp. is required in order to use this book. The book is designed to enhance the programs.

Please send me ________ copies of *40 Great Flight Simulator Adventures* at $9.95 each.
(ISBN No. 0-87455-022-X)

All orders must be prepaid in U.S. funds.

Subtotal ________
NC residents add 4.5% tax ________
$2.00 shipping and handling charge per book. ________
Total amount enclosed ________

To order this exciting adventure guide, mail the attached coupon with your payment to COMPUTE! Books, P.O. Box 5038, F.D.R. Station, New York, Ny 10150. Or call toll free 1-800-346-6767 (in NY 212-887-8525.)

☐ Payment enclosed (check or money order)
☐ Charge ☐ Visa ☐ MasterCard ☐ American Express

Name ________
Address ________
City ________ State ________ Zip ________
Please allow 4–6 weeks for delivery.

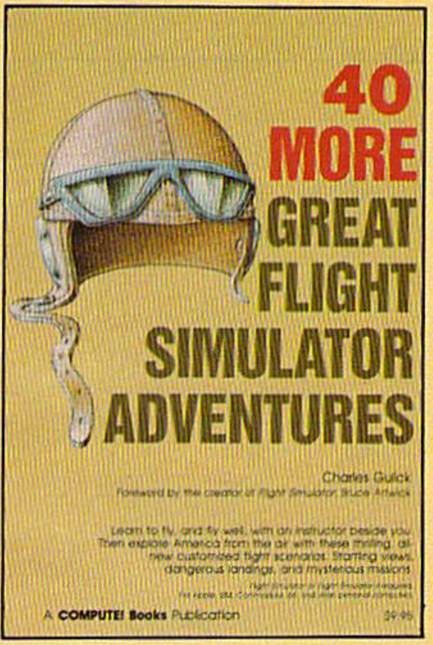
COMPUTE! Publications, Inc. abc
One of the ABC Publishing Companies

COMPUTE! books are available in the U.K., Europe, the Middle East, and Africa from Holt Saunders, Ltd., 1 St. Anne's Road, Eastbourne, East Sussex BN21 3UN, England.

Fly Faster and Farther

with COMPUTE!'s

40 More Great Flight Simulator Adventures


40
MORE
GREAT
FLIGHT
SIMULATOR
ADVENTURES
Charles Gulick
Foreword by the creator of Flight Simulator Bruce Artwick
Learn to fly, and fly well, with an instructor beside you. Then explore America from the air with these thrilling, all-new customized flight scenarios. Starting views, dangerous landings, and mysterious missions.
A COMPUTE! Books Publication
$9.95

This follow-up to the popular *40 Great Flight Simulator Adventures* brings you 40 more exciting, suspenseful flight simulator scenarios to help you get the most enjoyment from your *Flight Simulator* or *Flight Simulator II* software.

40 More Great Flight Simulator Adventures

Charles Gulick

Microsoft's *Flight Simulator* (IBM PC) and Sublogic's *Flight Simulator II* (Apple II, Commodore 64, Atari) are two of the most popular software packages today. They put you in the pilot's seat, letting you experience the thrill of flight. Now, *40 More Great Flight Simulator Adventures,* the second such guide, brings you more dazzling flights drawn from both fact and fancy.

Now you can fly where no one has flown before, with the author as your flight instructor. He helps you explore the unknown regions of flight simulation—taking you through cities, over mountains, under bridges—as you explore America from the air. Complete parameters and instructions at each step make flight easier and more exciting than ever before.

$9.95 ISBN 0-87455-043-2

Note: The *Flight Simulator* program itself is not included and must be purchased separately.

To order any COMPUTE! book, call toll free 800-346-6767 (in NY 212-887-8525). Or mail in the attached coupon with your payment. Include $2.00 shipping and handling per book.

Please send me ________ copies of *40 More Great Flight Simulator Adventures* at $9.95 each.
(ISBN 0-87455-043-2)

All orders must be prepaid in U.S. funds.

Subtotal ________

NC residents add 4.5% sales tax ________

$2.00 shipping and handling per book ($5.00 per book airmail) ________

Total amount enclosed ________

COMPUTE! Books
P.O. Box 5038
F.D.R. Station
New York, NY 10150

☐ Payment enclosed (check or money order)

☐ Charge ☐ Visa ☐ MasterCard ☐ American Express

Name ________________________________

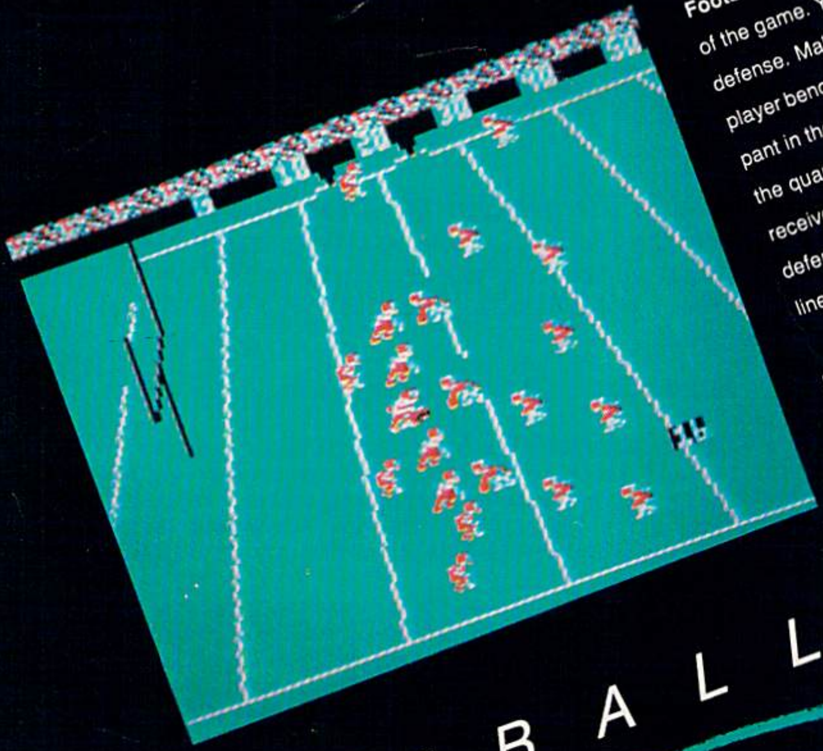
Address ________________________________

City ________________ State ________________ Zip ________________

Please allow 4–6 weeks for delivery.

COMPUTE! Publications, Inc. abc
Part of ABC Consumer Magazines, Inc.
One of the ABC Publishing Companies
825 7th Avenue, 6th Floor, New York, NY 10019
Publishers of COMPUTE!, COMPUTE!'s Gazette, COMPUTE!'s Gazette Disk, COMPUTE! Books, and COMPUTE!'s Apple Applications

COMPUTE! books are available in the U.K., Europe, the Middle East, and Africa from Holt Saunders, Ltd., 1 St. Anne's Road, Eastbourne, East Sussex BN21 3UN, England and in Canada from McGraw-Hill, Ryerson Ltd., 330 Progress Ave., Scarborough, Ontario, Canada M1P 2Z5.



FOOTBALL

A True-to-Life Simulation ...

Forget everything you've seen or heard about sports simulation programs; **Football** sets new standards in realism and playability by simulating the real physics of the game.

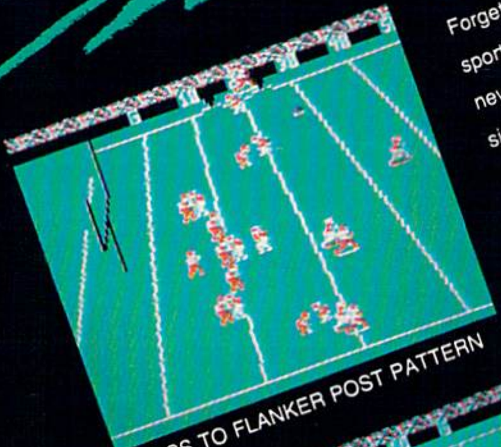
Every offensive and defensive player has individual physical attributes (speed, power, and catching ability). Each quarterback's passing abilities are different. Players act and move individually on each play. And you can adjust the performance characteristics of any player, any way you like.

Football's overhead 3D perspective gives you a clear view of the entire field. The ball carrier is always highlighted for easy identification. And **Football's** real-time 30-second clock means fast-moving action from start to finish, with no game-slowing disk access.

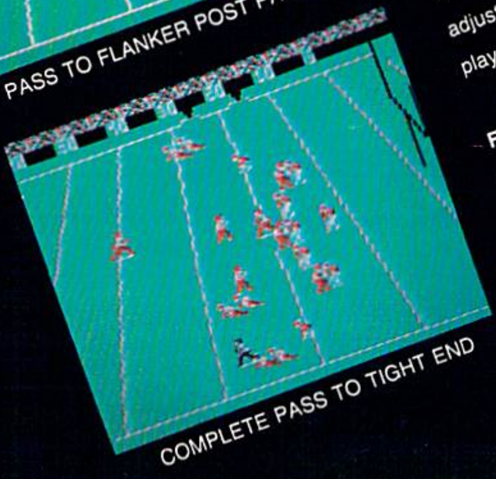
... With Spectacular Results!

Football puts you in control of every aspect of the game. You call the plays, offense and defense. Make substitutions from your 18-player bench. Then become an active participant in the play you've selected. You control the quarterback, then the running back or receiver once the ball is transferred. On defense, you become the in-action safety or linebacker for the play you've selected.

Discover how enjoyable a football simulation game can be. You will agree that **Football** is the first real football game on a computer. Available on disk for the Commodore 64/128 computers.



PASS TO FLANKER POST PATTERN



COMPLETE PASS TO TIGHT END

See Your Dealer ...

or write or call for more information. For direct order please enclose $39.95 plus $2.00 for shipping and specify UPS or first class mail delivery. Visa, MasterCard, American Express, Diners Club cards accepted.

Commodore 64 and Commodore 128 are trademarks of Commodore Electronics, Ltd.

subLOGIC
Corporation
713 Edgebrook Drive
Champaign IL 61820
(217) 359-8482 Telex: 206995
Order Line: (800) 637-4983
(except in Illinois, Alaska, and Hawaii)

GAZETTE contents

August 1986 Vol. 4, No. 8

features

The C64: A New Look for an Old Friend *Selby Bateman* .... 22 *
An Introduction to Assemblers for the Commodore 64 and 128 *Todd Heimarck* 30 128/64
Progamming the Z80 *Morris Simon* 38 128

reviews

Golden Oldies, Vol. 1 *Selby Bateman* 44 64
RadarBASIC 50K *Howard Parnes* 44 64
Lords of Conquest *George Miller* 45 64
Garry Kitchen's GameMaker *Neil Randall* 46 64
Cantus: The Music Improvisor *Art Hunkins* 50 64

games

Slots *Roger Sliva* .... 51 64/+4/16
Chopper 1 *Mike Sedore* 54 64
Pirate Cove *Barbara Schulak* 55 64

education/home applications

Address Cataloger *Kevin Mykytyn* 57 64
Computing for Families: Computers and the Audiovisual Imagination *Fred D'Ignazio* .... 79 *

programming

Expandable Graphics Dump *Fred Solmer* .... 59 128/64/+4
Machine Language for Beginners:
Turning a BASIC Arcade Game into Machine Language *Richard Mansfield* 61 128/64
TurboDisk 64 *Don Lewis* 64 64
TurboDisk Relocator *Dino Bavaro* 66 64
Turbo BootMaker *Bert Rozenberg* 67 64
TurboDisk 128 *Don Lewis* 68 128
Boldface *Thomas Carlson* .... 70 128/64/+4/16/V
KeyDef *A. F. Shepard* 71 128
128 Sprite Rotator *Mike Tranchemontagne* 74 128
Kaleidoscope Revisited *W. M. Shockley* .... 75 64/+4/16/V
Power BASIC: BASIC Line Extender *Jay A. Reeve* .... 76 64/+4/16
Hints & Tips: Simulating PRINT-AT and APPEND .... 80 128/64/+4/16/V

departments

The Editor's Notes *Richard Mansfield* .... 6 *
Gazette Feedback *Editors and Readers* .... 10 *
User Group Update .... 42 *
Simple Answers to Common Questions *Tom R. Halfhill* .... 78 *
Horizons: What is a Raster Interrupt? *Todd Heimarck* 81 64
News & Products .... 82 *
Bug-Swatter: Modifications and Corrections .... 85 *

program listings

COMPUTE!'s Gazette Author's Guide .... 86 *
How to Type In COMPUTE!'s Gazette Programs .... 87 *
The Automatic Proofreader .... 88 128/64/+4/16/V
MLX 89 128/64

Advertiser's Index .... 128 *

*****=General, **V**=VIC-20, **64**=Commodore 64, **+4**=Plus/4, **16**=Commodore 16, **128**=Commodore 128

COMPUTE!'s GAZETTE is published monthly by **COMPUTE!** Publications, Inc., 825 7th Avenue, New York, NY 10019 USA. Phone: (212) 265-8360. Editorial offices are located at 324 West Wendover Avenue, Greensboro, NC 27408. Domestic Subscriptions: 12 issues, $24. POSTMASTER: Send address changes to *COMPUTE!'s GAZETTE,* P.O. Box 10957, Des Moines, IA 50340. Second class application pending at Greensboro, NC 27403 and additional mailing offices. Entire contents copyright ©1986 by **COMPUTE!** Publications, Inc. All rights reserved, ISSN 0737-3716.

COMPUTE! Publications, Inc. is part of ABC Consumer Magazines, Inc., One of the ABC Publishing Companies: ABC Publishing, President, Robert G. Burton; 1330 Avenue of the Americas; New York, New York 10019.

editor's notes

Nobody's quite sure what programming talent is, where it comes from, or whether or not there are correlative talents. It is popularly assumed that facility in math ties in with aptitude for computer programming. Some colleges even make math courses prerequisites to a major in computer science.

However, an extensive survey of the best programmers at a major American corporation revealed that there is no direct link between mathematical facility and the ability to effectively communicate with computers. Instead, the survey uncovered a strong correlation with *musical* ability and with those who had majored in English.

It's easy enough to guess why English majors would do well—they've spent years developing their ability to communicate effectively, and programming is essentially a special kind of communication: man to machine.

What musical aptitude has to do with it is somewhat less easily imagined. Some have suggested that music combines the freedom of expression of art with formal rules and that, like programming, it calls upon a person's imagination while simultaneously requiring a focused attention to the rules of the game.

Recent studies of elementary and junior high school students who show an aptitude for computer programming have revealed an interesting relationship: the best programmers also scored highest on personality tests in the areas of *adaptability* and *flexibility* and scored lowest on tests of *rigidity.* This parallels somewhat the musical abilities association and suggests that these personality types flourish in the atmosphere of restrained freedom characteristic of both musical and programming activities. Notably, students scoring at the extreme ranges of the masculinity/femininity scales correlated poorly with programming skill. In fact, any rigidities of behavior seemed to retard programming abilities.

Of course, much more study needs to be done before any truly predictive tests can be developed. These early studies reveal tentative correlations, but it's too soon to know whether these results will endure, will eventually prove to be substantial indicators of this new talent.

And there are clearly many kinds of programming. Designing the most efficient sorting algorithm in machine language requires considerable experience and not a little patience. Working with a team to put together an airline reservation application program demands tolerance of the considerable delay between actions and results as well as the capacity for intensive communal labor. Writing an arcade game calls upon special imaginative gifts and a sensitivity to playability, that balance between simplicity and challenge.

Programs are created when the programmer communicates rules for the computer to follow, man to machine. But there's another more important act of communication—the interaction between the computer and the program's user. This is communication machine to man. No matter how full of features, how speedy or well-constructed it is, a word processor which doesn't communicate effectively with the user will never become popular. Perhaps it's in this area of programming, often called the *user interface,* where the abilities of English majors are particularly valuable.

Ultimately, it would be quite valuable to be able to know in advance who is and who isn't likely to do well talking to machines. Children could be guided into or away from this field; corporations would be able to refine their hiring methods; and otherwise potentially excellent programmers wouldn't be excluded from computer science courses simply because they weren't adept at calculus. However, it's equally possible that there is no reliable predictor and the only proof of programming ability is the writing of a good program.

Here at COMPUTE! we've published excellent programs created by every age group, from every geographical area, programs written by college professors and high school students—in short, polished programs written by a complete spectrum of educational and occupational backgrounds. No real patterns have emerged except that the majority of submissions are from males. But computers are a quite new phenomenon and they are rapidly penetrating the population at large. We'll keep a lookout. If any trends develop, we'll let you know.

Richard Mansfield

Richard Mansfield
Senior Editor

First, there was PHANTASIE™, one of the most popular fantasy role-playing games ever made.

Now, a new adventure begins...

PHANTASIE II™

For no reason other than for perverse pleasure, the Dark Lord Nickademus fashioned an evil orb, through which he cast a curse on a beautiful island and its people.

Now, six intrepid adventurers under your guidance brave the cruel warlock's wrath to find and destroy his nefarious handiwork.

If you've played the original PHANTASIE, you may transfer those same characters to this sequel. If you haven't, don't worry. You can always start with new characters that range from mere humans to exotic, unearthly creatures.

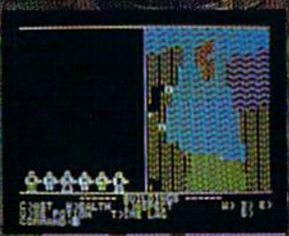
This exciting adventure can start right away by a quick visit to your local computer/software or game store today!

If there are no convenient stores near you, VISA & M/C holders can order this $39.95 game by calling **toll-free 800-443-0100, x335**. To order by mail, send your check to: **STRATEGIC SIMULATIONS, INC.**, 1046 N. Rengstorff Ave., Mountain View, CA 94043. (California residents, add 7% sales tax.) Please specify computer format and add $2.00 for shipping and handling. All our games carry a "14-day satisfaction or your money back" guarantee. **WRITE FOR A FREE COLOR CATALOG OF ALL OUR GAMES TODAY.**

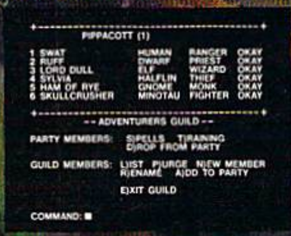
ON DISK FOR 48K APPLE® II SERIES & C-64™.

PHANTASIE and PHANTASIE II coming soon on the ATARI® ST!

© Copyright 1986 by **STRATEGIC SIMULATIONS, INC.** All rights reserved.

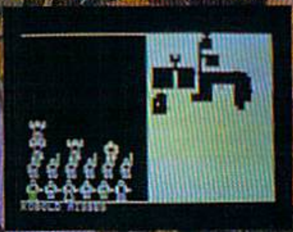


A small section of the wilderness your band must explore.

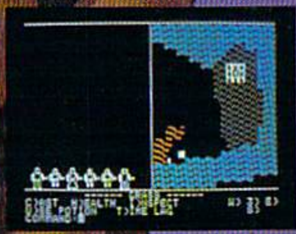


```
+-----------------------------------------+
           PIPPACOTT (1)

1 SWAT                HUMAN    RANGER  OKAY
2 RUFF                DWARF    PRIEST  OKAY
3 LORD DULL           ELF      WIZARD  OKAY
4 SYLVIA              HALFLIN  THIEF   OKAY
5 HAM OF RYE          GNOME    MONK    OKAY
6 SKULLCRUSHER        MINOTAU  FIGHTER OKAY
+-----------------------------------------+
         -- ADVENTURERS GUILD --

PARTY MEMBERS:   S)PELLS  T)RAINING
                 D)ROP FROM PARTY

GUILD MEMBERS:  L)IST  P)URGE  N)EW MEMBER
                R)ENAME   A)DD TO PARTY

                E)XIT GUILD

COMMAND: ■
```

A sample of recruits from the Adventurers' Guild.



You must map out dungeons and fend off hideous monsters.



Your group has found Pluto's Palace in the Netherworld.

APPLE, C-64 and ATARI ST are trademarks of Apple Computer, Inc., Commodore Electronics, Ltd., and Atari, Inc., respectively.

COMPUTE! Publications, Inc. abc
One of the ABC Publishing Companies

Publisher James A. Casella
Founder/Editor in Chief Robert C. Lock
Senior Editor Richard Mansfield
Managing Editor Kathleen Martinek
Executive Editor Selby Bateman
Editor Lance Elko
Assistant Editor Todd Heimarck
Production Director Tony Roberts

Editors
Tom R. Halfhill, Editor, COMPUTE! Magazine; Stephen Levy, Editor, COMPUTE! Books Division; Gail Cowper, Production Editor; Ottis R. Cowper, Technical Editor; Charles Brannon, Program Editor

Assistant Editors
Gregg Keizer, Ann Davies (Books); George Miller, (Technical); Philip Nelson (COMPUTE! Magazine); Kathy Yakal, Assistant Features Editor; Mark Tuttle, Submissions Reviewer

Editorial Programmers
Patrick Parrish (Supervisor), Tim Victor, Kevin Mykytyn

Programming Assistants
David Florance, David Hensley

Administrative Staff
Executive Assistant, Debi Nash; Julia Fleming, Iris Brooks, Mary Hunt, Sybil Agee

Production
Irma Swain, Production Manager; Janice Fary, Art & Design Director; Lee Noel, Assistant Editor, Art & Design; De Potter, Mechanical Art Supervisor; Terry Cash, Carole Dunton, Typesetting

Artists
Dabney Ketrow (Publications), Debbie Bray (Books); Harry Blair, Illustrator

Associate Editors
Jim Butterfield (Toronto), Harvey Herman (Greensboro), Fred D'Ignazio (Alabama)

Customer Service
Diane Longo, Customer Service Manager; Orchid Tamayo, Dealer Sales Supervisor; Cassandra Greene, Customer Service Supervisor

Receptionist, Anita Armfield

Warehouse Manager, John Williams

President James A. Casella
Vice President, Advertising Richard J. Marino
Director, Finance & Planning Chris Savine

Promotion
Caroline Dark, Promotion Assistant

Advertising Sales
Richard J. Marino, Vice President, Advertising Sales; Peter Johnsmeyer, Director of Advertising Sales; Bernard J. Theobald, Jr., Associate Advertising Director; Kathleen Hanlon, Production Coordinator

Sales Representatives

Jerry Thompson	415-348-8222
Harry Blair	919-275-9809

Address all advertising materials to:
Kathleen Hanlon, COMPUTE!'s GAZETTE
324 West Wendover Ave., Suite 200, Greensboro, NC 27408

Sales Offices

Northeast	212-315-1665
Mid-Atlantic	212-315-1665
Southeast	212-275-9809

Sales Offices, Jules E. Thompson, Inc.
1290 Howard Avenue
Suite 303
Burlingame, CA 94010

Midwest	312-726-6047
Texas	713-731-2605
Pacific Northwest	415-348-8222
Northern CA	415-348-8222
Southern CA	213-378-8361
Arizona	213-378-8361
New Mexico	213-378-8361
Colorado	303-595-9299

Member
ABC
Audit Bureau of Circulations

COMPUTE! Publications, Inc., publishes
COMPUTE! **COMPUTE! Books** ***COMPUTE!'s GAZETTE***
COMPUTE!'s GAZETTE Disk ***Apple Applications***

Editorial Office:
324 West Wendover Ave., Suite 200, Greensboro, NC 27408

Corporate Offices:
825 7th Avenue, New York, NY 10019

Customer Service:
P.O. Box 5038, F.D.R. Station, New York, NY 10150
Telephone: (In NY) 212-887-8525;
(In U.S.) Toll free 1-800-346-6767
Office Hours: 8:30 AM to 4:30 PM Monday–Friday

Subscription Orders
COMPUTE!'s GAZETTE
P.O. Box 10957, Des Moines, IA 50340

TOLL FREE
Subscription Order Line
1-800-247-5470
In IA 1-800-532-1272

COMPUTE!'s GAZETTE
Subscription Rates

(12 Issue Year): US (one year) $24. Canada, Mexico and Foreign Surface Mail $30. Foreign Air Mail $65.

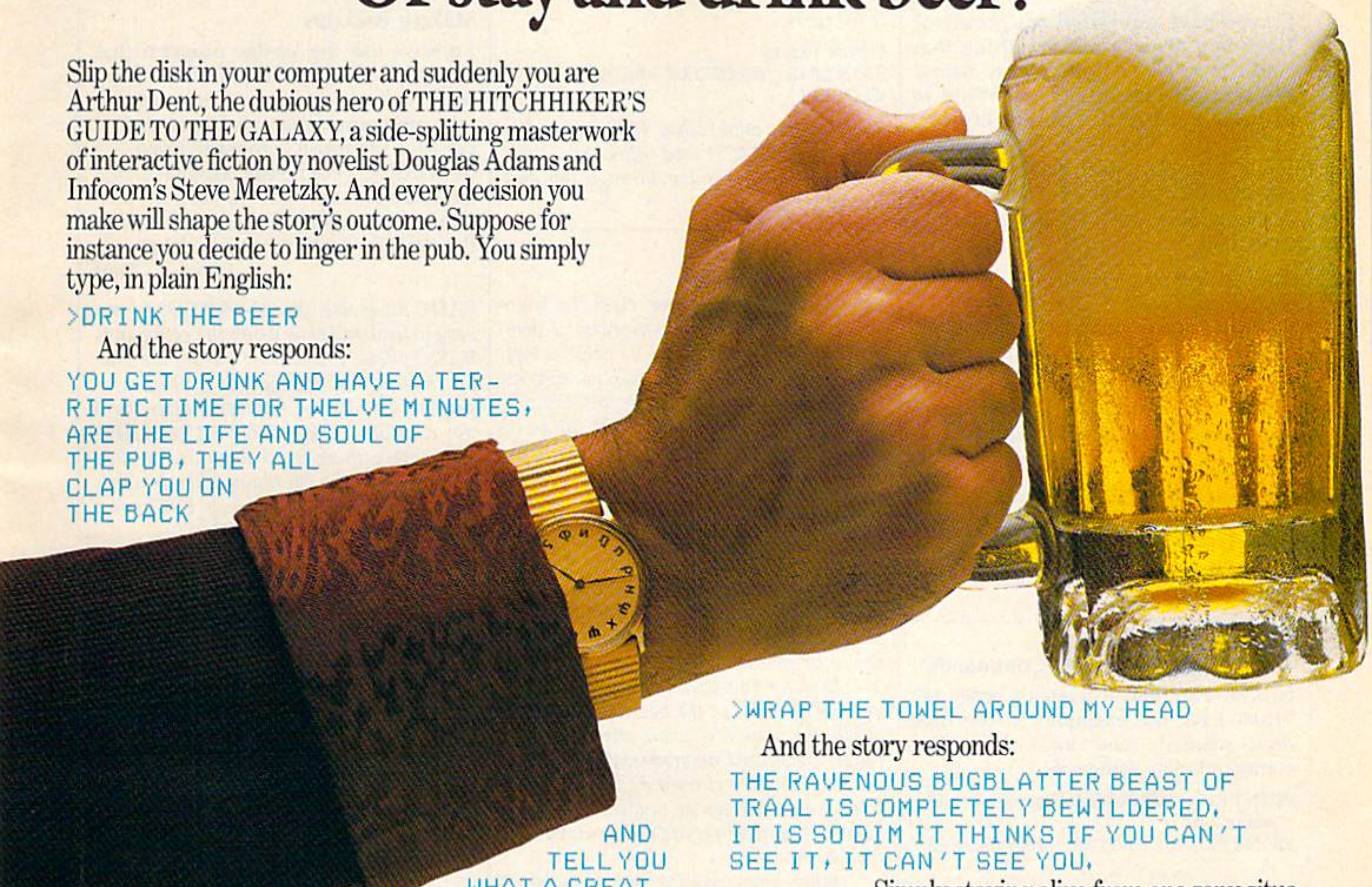
The COMPUTE!'s GAZETTE subscriber list is made available to carefully screened organizations with a product or service which may be of interest to our readers. If you prefer not to receive such mailings, please send an exact copy of your subscription label to: COMPUTE!'s GAZETTE, P.O. Box 10958, Des Moines, IA 50950. Include a note indicating your preference to receive only your subscription.

Authors of manuscripts warrant that all materials submitted to COMPUTE!'s GAZETTE are original materials with full ownership rights resident in said authors. By submitting articles to COMPUTE!'s GAZETTE, authors acknowledge that such materials, upon acceptance for publication, become the exclusive property of **COMPUTE!** Publications, Inc. No portion of this magazine may be reproduced in any form without written permission from the publisher. Entire contents copyright © 1986 **COMPUTE!** Publications, Inc. Rights to programs developed and submitted by authors are explained in our author contract. Unsolicited materials not accepted for publication will be returned if author provides a self-addressed, stamped envelope. Where programs are included in an article submission, a tape or disk must accompany the submission. Printed listings are optional, but helpful. Articles should be furnished as typed copy (upper and lowercase, please) with double spacing. Each article page should bear the title of the article, date, and name of the author. **COMPUTE!** Publications, Inc., assumes no liability for errors in articles or advertisements. Opinions expressed by authors are not necessarily those of **COMPUTE!** Publications, Inc. **COMPUTE!** Publications assumes no responsibility for damages, delays, or failure of shipment in connection with authors' offer to make tape or disk copies of programs published herein.

PET, CBM, VIC-20, Commodore 64, Plus/4, 16, and 128 are trademarks of Commodore Business Machines, Inc., and/or Commodore Electronics Limited. Other than as an independent supplier of quality information and services to owners and users of Commodore products, **COMPUTE!** Publications, Inc., is in no way associated with Commodore Business Machines, Inc., or any of its subsidiaries.

Earth will be destroyed in 12 minutes to make way for a hyperspace bypass.

Should you hitchhike into the next galaxy? Or stay and drink beer?



Slip the disk in your computer and suddenly you are Arthur Dent, the dubious hero of THE HITCHHIKER'S GUIDE TO THE GALAXY, a side-splitting masterwork of interactive fiction by novelist Douglas Adams and Infocom's Steve Meretzky. And every decision you make will shape the story's outcome. Suppose for instance you decide to linger in the pub. You simply type, in plain English:

```
>DRINK THE BEER
```

And the story responds:

```
YOU GET DRUNK AND HAVE A TER-
RIFIC TIME FOR TWELVE MINUTES,
ARE THE LIFE AND SOUL OF
THE PUB, THEY ALL
CLAP YOU ON
THE BACK
                                        AND
                                   TELL YOU
                              WHAT A GREAT
                        CHAP YOU ARE AND
                  THEN THE EARTH GETS
         UNEXPECTEDLY DEMOLISHED. YOU
WAKE UP WITH A HANGOVER WHICH LASTS
FOR ALL ETERNITY. YOU HAVE DIED.
```

Suppose, on the other hand, you decide to:

```
>EXIT THE VILLAGE PUB THEN GO NORTH
```

In that case you'll be off on the most mind-bogglingly hilarious adventure any earthling ever had.

You communicate – and the story responds – in full sentences. So at every turn, you have literally thousands of alternatives. If you decide it might be wise, for instance, to wrap a towel around your head, just say so:

```
>WRAP THE TOWEL AROUND MY HEAD
```

And the story responds:

```
THE RAVENOUS BUGBLATTER BEAST OF
TRAAL IS COMPLETELY BEWILDERED.
IT IS SO DIM IT THINKS IF YOU CAN'T
SEE IT, IT CAN'T SEE YOU.
```

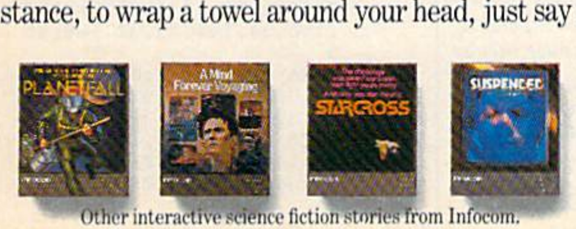
Simply staying alive from one zany situation to the next will require every proton of puzzle solving prowess your mere mortal mind can muster. So put down that beer and hitchhike down to your local software store today. Before they put that bypass in.

The Hitchhiker's Guide to the Galaxy
DON'T PANIC
INFOCOM
ORDER FOR DESTRUCTION
MICROSCOPIC SPACE FLEET
DON'T PANIC

Comes complete with Peril Sensitive Sunglasses, a Microscopic Space Fleet, a DON'T PANIC Button, a package of Multipurpose Fluff and orders for the destruction of your home and planet.

INFOCOM™

For more information call 1-800-262-6868. Or write to us
at 125 CambridgePark Drive, Cambridge, MA 02140.



Other interactive science fiction stories from Infocom.

©1985 Infocom, Inc. THE HITCHHIKER'S GUIDE TO THE GALAXY is a trademark of Douglas Adams. PLANETFALL, STARCROSS, SUSPENDED and A MIND FOREVER VOYAGING are trademarks of INFOCOM, Inc.

feedback

Editors and Readers

Do you have a question or a problem? Have you discovered something that could help other Commodore users? We want to hear from you. Write to Gazette Feedback, COMPUTE!'s GAZETTE, P.O. Box 5406, Greensboro, NC 27403. We regret that due to the volume of mail received, we cannot respond individually to programming questions.

Switching Cases

I was recently fooling around with CHR$ and discovered that PRINT CHR$ (14) puts the letters into upper/lowercase mode. Is there a CHR$ that changes them back to uppercase/graphics?

Matthew Whitaker

Try PRINT CHR$(142) for uppercase/graphics. You can find a complete list of these CHR$ codes (also called ASCII codes) in an appendix at the end of your user's guide.

The Grammar Of Disk Commands

How do I rename or scratch a program? When I try the examples in the disk drive manual, they don't work. The commands I'm using are

PRINT#15, "RENAME0: newname=old name" ,8
PRINT#15, "SCRATCH0: programname" ,8

Julie Anne Mood

Computers are quite literal and are sensitive to spelling and syntax. You've made at least one error—the ,8 should not be in the command. Also, before you PRINT# to channel 15, it must be opened. Type ***OPEN 15,8,15*** *to prepare channel 15; when you're done sending disk commands,* ***CLOSE 15*** *turns it off.*

All disk commands can be abbreviated to a single letter; "R" instead of "RENAME" and "S" instead of "SCRATCH". This saves you a little typing. Also, the character after the command is the number zero (0), not the letter O. So, to scratch a file called PINETREE, enter the three lines below:

OPEN 15,8,15
PRINT#15, "S0:PINETREE"
CLOSE15

To rename a file currently called OAK to the new name CEDAR, enter these three lines:

OPEN 15,8,15
PRINT#15, "R0:CEDAR=0:OAK"
CLOSE15

Readers who own a 128 can use the built-in SCRATCH and RENAME commands instead of going through the disk command channel.

Orderly Characters

I'm taking a computer class in high school. My teacher showed us a program that waits for you to press a key and then prints the character and its ASCII code. I translated it to Commodore BASIC (listing enclosed). Most of the keys work, but some don't. Can you explain what's wrong?

Mark Riddle

One of the lines in your program is ***IF A$>="0" THEN 50****. Line 50 then prints the character and its ASCII code. If the character in A$ is less than "0", the program loops back to check for another key to be pressed.*

Look for an appendix that lists ASCII and CHR$ codes in the back of your user's guide, the book that came with the computer. These are Commodore ASCII codes, not true ASCII, so they may differ slightly from the ASCII you've studied in school. Some of the numbers are different, but the idea is the same.

When your computer executes the IF statement, what it's really doing is checking the ASCII value of the string variable A$ against the ASCII value of the string literal *"0". (A string literal is a series of zero or more characters inside quotation marks.) The* character *"0" has an ASCII value of 48, as you'll see if you examine the appendix in the user's guide. Or type* ***PRINT ASC("0")*** *to see what your computer says. You could also try* ***PRINT CHR$(48)****, to verify that character number 48 is a zero.*

Your program is almost correct, but it prints only characters higher than "0" on the list of ASCII codes. It ignores characters such as !, #, or / (with corresponding ASCII codes of 33, 35, 47) because they're less than CHR$(48), the string literal "0". To fix it, change the IF statement to ***IF A$>= CHR$(0)****, or if you want to bypass the control codes (color changes and the like),* ***IF A$>= CHR$(32)****.*

Making Backups

I always use the Wedge program that comes on the 1541 Demo disk. I have tried repeatedly to copy the two separate programs from the Demo disk. I can save the BASIC program called "C-64 WEDGE", but no matter what I try, I am unable to save the "DOS 5.1" program, the machine language portion of the Wedge. Can you set me right?

James C. Platt

BASIC programs like "C-64 WEDGE" are easy to load and save using the commands BASIC offers. BASIC also has a provision for loading machine language (ML) programs. Just add the number 1 after the 8 (for example, LOAD "DOS 5.1",8,1). Unfortunately, there is no command to save an ML file on the 64. Many other computers, including the Commodore 128, have a command to do this (BSAVE).

One solution is to use the "MLX" machine language editor. This only works, however, if you know the starting and ending addresses of the program you're trying to save. To back up DOS 5.1, you'd load and run MLX and give it a starting address of CC00, ending address CFFF. Load DOS 5.1 from MLX, switch disks, and save to the new disk (see the MLX instruction page for more details). If you don't know the starting and ending addresses of the program, you can't use MLX to make a backup.

The following short program simplifies the copying of Commodore 64 program files. It works with both ML and BASIC programs. Before you run it, put a disk into the drive. When the program is run, it writes a program called COPYIT on the disk.

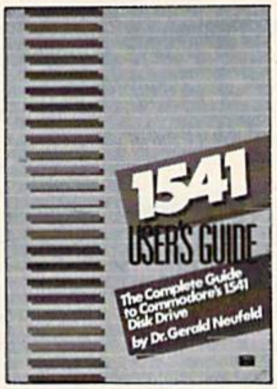
```
JF 10 OPEN2,8,1,"COPYIT":PRINT
      #2,CHR$(0);CHR$(192);
JG 20 C=0:FORA=1TO139:READB:C=
      C+B:PRINT#2,CHR$(B);:NEX
      T:CLOSE 2
CK 30 IFC<>20455THENPRINT"
      {CLR}{2 DOWN}DATA ERROR"
      :STOP
CS 40 PRINT"{CLR}{2 DOWN}DONE"
EK 50 DATA 32,109,192,32,253,1
      74,32,158,173,32,130,183
      ,166,34,164,35,32,189,25
      5
DP 60 DATA 169,2,162,8,160,0,3
      2,186,255,32,192,255,162
      ,2,32,198,255,32,228
QM 70 DATA 255,160,0,145,251,1
      65,144,208,6,32,125,192,
      76,36,192,165,251,133,25
      3
```

BRADY adds more power to your Commodore.

Nobody understands how to get the most out of Commodore computers—without having to add more machine—better than Brady Books. And now you can too. Call toll-free or use the coupon below to order today.

INSIDE COMMODORE DOS
THE COMPLETE GUIDE TO THE 1541 DISK OPERATING SYSTEM

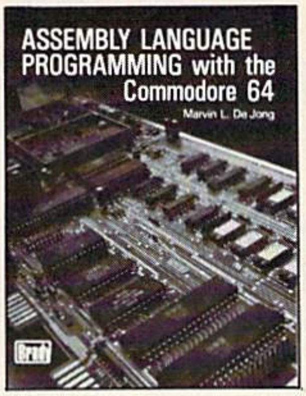
1. Teaches you about using the DOS, disk formatting and organization, direct-access programming, DOS protection recovering "damaged" data, and includes an overview of DOS 2.6. Also includes disk RAM map, math conversion routines, and a disassembled and annotated DOS. $19.95


1541 USER'S GUIDE
The Complete Guide to Commodore's 1541 Disk Drive
by Dr. Gerald Neufeld

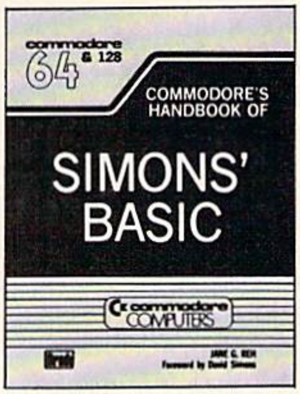
2. Clarifies confusing areas and corrects omissions in the equipment's user's manual. You'll learn how to validate, initialize, reuse disks, and more. Also includes a mailing list application listing for demonstration as well as some of the best utility programs. $19.95

MACHINE • LANGUAGE
for the Commodore 64 and other Commodore computers
• Jim Butterfield •

3. A revision of the bestselling classic (old edition shown above), this real learn-by-doing tutorial includes discussions of chip architecture along with commands and important concepts such as output, address modes, memory maps, and linking BASIC to machine language. Perfect for new 1028 owners. $14.95 (Disk available)


ASSEMBLY LANGUAGE PROGRAMMING with the Commodore 64
Marvin L. De Jong
Brady

4. Perfect beginner's introduction to assembler. Shows how to write, debug, and execute programs and includes exercises to familiarize you with the instruction set of the 6510 processor. $14.95 (Disk and kit available)


commodore 64 & 128
COMMODORE'S HANDBOOK OF
SIMONS' BASIC
commodore COMPUTERS
Brady

5. With a foreword written by David Simon himself, here's the first and last word on Simons' BASIC. A complete reference to 144 commands, and includes a "guided-tour" of practical tips for this language. For both the 64 and 128. $12.95

Now at your book or computer store. Or order toll-free today: **800-624-0023** In New Jersey: 800-624-0024

BRADY COMMUNICATIONS COMPANY, INC.
c/o Prentice Hall,
P.O. Box 512, W. Nyack, NY 10994

Circle the numbers of the titles you want below. (Payment must be enclosed; or, use your charge card.) Add $1.50 for postage and handling.
Enclosed is check for $_____ or charge to
☐ MasterCard ☐ VISA.

Acc't # ________________ Exp. date ________
Signature ________________________
Name ________________________
Address ________________________
City ____________ State _______ Zip _______
(New Jersey residents, please add applicable sales tax.)
Dept. 3

GR-COGA-BX(8)

1 (0-8359-3091-2) 2 (0-89303-738-9) 3 (0-89303-652-8) 4 (0-89303-319-7) 5 (0-89303-419-3)

Brady

```
HG 80 DATA 165,252,133,254,32,
      109,192,32,228,255,201,6
      7,208,249,169,2,162,8,16
      0
AR 90 DATA 1,32,186,255,32,192
      ,255,162,2,32,201,255,32
      ,132,192,32,125,192,165,
      251
XF 100 DATA 197,253,208,244,16
       5,252,197,254,208,238,3
       2,132,192,169,52,133,25
       1,169
GB 110 DATA 8,133,252,169,2,32
       ,195,255,76,204,255,230
       ,251,208,2,230,252,96,1
       60
KR 120 DATA 0,177,251,76,210,2
       55
```

To copy a program, ***LOAD "COPY IT" ,8,1****, then type* ***NEW****. Insert the disk containing the program to be copied into the drive. Type* ***SYS 49152,"filename"****, substituting the name of the file you want to copy for "filename".*

When the red disk drive light goes off, remove the disk and put the disk onto which you want to copy the program into the drive. Press the C key (remember that C means Copy). When the READY prompt appears, your copy is done.

Commodore POKEs

Could you print a list of POKEs for the 64 like the ones you published for the 128 in the March issue? These were the POKEs for disabling RUN/STOP–RESTORE and the like.

Stuart Hopcraft

We've assembled the following useful POKEs from previously published lists.

	64	VIC	Plus/4, 16	128
Disable LIST	775,191	775,223	774,187	775,139
Enable	775,167	775,199	774,110	775,81
Disable SAVE	819,246	818,73	816,136	818,180
Enable	819,245	818,133	816,164	818,78
Disable LOAD	816,157	816,103	814,239	816,0
Enable	816,165	816,73	814,74	816,108
Disable RUN/STOP	808,239	808,100	806,103	808,100
Enable	808,237	808,112	806,101	808,110
Disable RESTORE	792,193	792,7	—	792,125
Enable	792,71	792,173	—	792,64
Disable keyboard	649,0	649,0	1343,0	2592,0
Enable	649,10	649,10	1343,10	2592,10
No keys repeat	650,64	650,64	1344,64	2594,64
All keys repeat	650,128	650,128	1344,128	2594,255
Enable repeating keys (space, delete, and cursor keys)	650,0	650,0	1344,0	2594,0
Clear keyboard buffer (before INPUT)	198,0	198,0	239,0	208,0
Change character color, *x* is 0–7 for VIC, 0–15 for others	646,*x*	646,*x*	1339,*x*	241,*x*
Remove line numbers during LIST	22,35	22,35	22,35	24,37
Enable	22,25	22,25	22,25	24,27

If you disable the keyboard in direct mode, you won't be able to enter the POKEs to get it back because, of course, the keyboard is inoperative. RUN/STOP–RESTORE still works, unless you've disabled it, too, and will allow you to regain a functional keyboard. Also, strange things happen when you POKE22,35 to stop the printing of line numbers. For one thing, printing a string inside quotation marks (PRINT "ABC") won't work, although string variables *can still be printed.*

The POKE to remove line numbers gives you a simple sort of word processor. You can type a message with line numbers as if it were a BASIC program, enter the POKE, and then LIST to the printer. Your message will print out with no numbers.

Reprogramming The Function Keys

Is there a way to disable the Plus/4's function keys (which are preset), so they could be used for various functions in other programs?

Frank E. Armstrong

The 128, Plus/4, and 16 all have a KEY command which does two things. Type KEY all by itself and you'll see the current list of function key definitions. It also allows you to redefine the strings printed by the function keys. Entering ***KEY 1, "OPEN 4,4: CMD4: LIST" + CHR$ (13)*** *would change f1 to print the commands for listing a program to the printer plus a carriage return, the CHR$(13). Add a number 1–8 after KEY, followed by a comma and the characters or CHR$ codes you wish to be printed.*

To make the function keys act as they do on the VIC and 64, enter these lines:

```
10 C=133
20 FOR J = 1 TO 7 STEP 2
30 KEY J, CHR$(C): KEY J+1,
   CHR$(C+4)
40 C = C+1: NEXT J
```

After running this program, the function keys will be defined as the ASCII codes 133–140. A program could test for f3, for example, with something like ***411 GETKEY A$: IF A$ = CHR$(134) THEN 500****. At that point in the program, if the user pressed f3, the program would go to line 500.*

Spelling Practice

I use "SpeedCheck" (December 1985), the spelling checker for *SpeedScript*, as an educational aid for my three elementary school children. I encourage them to bring home a list of their spelling words, which I then enter into the SpeedCheck dictionary of words. Once this is done, I recite the words as my child types them in with *SpeedScript*. The spelling checker then highlights any misspelled words.

This not only makes studying the spelling list more fun, it also helps the child learn the computer keyboard.

Richard L. Eberhardy

You've invented an interesting new application for "SpeedCheck"; it sounds as if it works well.

Nested Loops

In one of your programs, a common mistake was made. FOR and NEXT should be used in pairs, not FOR-FOR followed by NEXT-NEXT. A proposed solution for "Bug-Swatter" is to split that part of the program into two separate loops.

G. Brandt

That part of the program is written correctly; there's no error in the line you mentioned. The situation you've described is a nested FOR-NEXT loop, *where one loop is inside another. Type in the following program to see how nested loops operate. It works on all Commodore computers.*

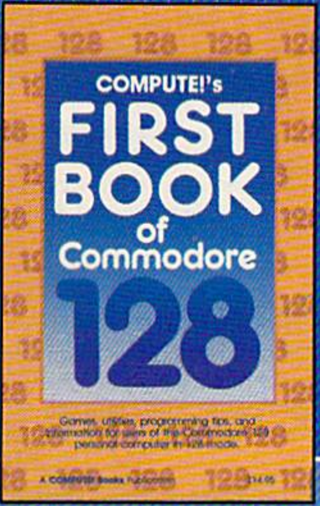
```
10 FOR J = 1 TO 5
20 PRINT J, "OUTER LOOP"
30 FOR K = 1 TO 3
40 PRINT K;"INNER";
50 NEXT K: PRINT
60 NEXT J
```

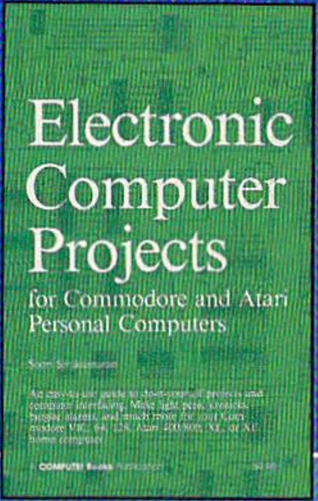
The loop that uses the variable K as an index, lines 30–50, counts from 1 to 3. But it's completely inside the J-loop, which repeats 5 times, so the K-loop counts to 3 a total of 5 times. The "OUTER LOOP" message prints 5 times, while the "INNER" message appears 15 times (5 × 3).

This is the correct method for using two loops at the same time. The inner loop

Two Exciting New Books

from COMPUTE!


COMPUTE!'s
FIRST BOOK of Commodore 128
Games, utilities, programming tips, and information for users of the Commodore 128 personal computer in 128 mode.
A COMPUTE! Books Publication
$14.95


Electronic Computer Projects
for Commodore and Atari Personal Computers
Soori Sivakumaran
COMPUTE! Books Publication

COMPUTE!'s First Book of the Commodore 128

A spectacular collection of articles and programs exclusively for the Commodore 128 *in 128 mode*.

Edited

The editors at COMPUTE! Publications have collected some of the best games, programs, and tutorials for the Commodore 128 from *COMPUTE!* and *COMPUTE!'s Gazette*, plus some never-before-published articles and programs. Learn how to create windows, program sound, and make disks autoload. You'll even find a map of all the important memory locations. There's something for every 128 user. All programs run in 128 mode. *A disk is available which includes programs in the book, $12.95.*

$14.95 ISBN 0-87455-059-9

Electronic Computer Projects

Learn how to build all kinds of new devices to interface with your computer from inexpensive, available parts.

For the Commodore 64, 128, VIC, and any eight-bit Atari personal computer.

Soori Sivakumaran

This introduction to digital electronics and computer interfacing is the easy way to learn how computers interact with the outside world. Using a Commodore 64, 128, VIC, or any eight-bit Atari computer and *Electronic Computer Projects*, you'll be guided through the steps to building a joystick, light pen, game paddle, and numerous other devices. And since each project is independent from the others, you can choose only those projects that interest you. All the projects can be built at home and most require fewer than half a dozen parts.

$9.95 ISBN 0-87455-052-1

Visit your local book or computer store for these new titles. Or order directly from COMPUTE! Books. Call toll-free 800-346-6767 (in NY 212-887-8525) or write COMPUTE! Books, P.O. Box 5038, F.D.R. Station, New York, NY 10150.

Please include $2.00 per book ($5.00 air mail) for shipping and handling. NC residents add 4.5 percent sales tax. Allow 4–6 weeks from receipt of order for delivery.

COMPUTE! Publications, Inc. abc

Part of ABC Consumer Magazines, Inc.
One of the ABC Publishing Companies
825 7th Avenue, 6th Floor, New York, NY 10019
Publishers of COMPUTE!, COMPUTE!'s Gazette, COMPUTE!'s Gazette Disk, COMPUTE! Books, and COMPUTE!'s Apple Applications

COMPUTE! books are available in the U.K., Europe, the Middle East, and Africa from Holt Saunders, Ltd., 1 St. Anne's Road, Eastbourne, East Sussex BN21 3UN, England, and in Canada from McGraw-Hill, Ryerson Ltd., 330 Progress Ave., Scarborough, Ontario, Canada M1P 2Z5.

is said to be nested in the outer loop. Note in the example above that line 10 starts the J-loop and line 60 ends it. The K-loop runs from line 30 to 50. The first loop to start should always be the last to finish. Another way of looking at it is that a nested loop should be completely inside the outer loop.

Placing one loop inside another is a useful programming technique. It's used widely in alphabetizing and sort routines and comes in handy when you're working with arrays.

The Paperwork Stacks Up

Here is a program that doesn't work on my 128:

```
10 FOR A = 1 TO 10
20 PRINT "HELLO";
30 GOSUB 200
40 END
200 PRINT "GOODBYE"
210 NEXT A
220 RETURN
```

I've programmed for a few years with the Apple IIe, TI-99/4A, and now the 128, and I can't say I've run across this problem before. Could you please explain why this program won't work?

L. Darrell Olson

You cannot split a FOR-NEXT loop, putting the FOR in the main program and the NEXT in a subroutine. Here's why:

Imagine that you've received several letters in the mail and you place them, one atop another, in a neat pile. Each piece of mail is covered by another, except the one on the top. To get to the third one down, you must remove the two letters from the top.

Computers have an area of memory called the stack, *which operates a lot like this fictional pile of correspondence. You can push numbers onto the stack and pull numbers off the top. But only the number on top of the stack is directly accessible.*

The Commodore 128 (as well as the VIC, 64, Plus/4, and 16) saves various information on the stack. In a simple FOR-NEXT loop, the FOR pushes information about the loop onto the stack. Then, when the 128 sees the NEXT instruction, it pulls that information off the stack and decides whether the loop should continue or end. If the loop isn't finished, the information remains on the stack. The most recently started loop has its data on top of the stack.

Incidentally, this is the technical reason for the nested-loop rule mentioned in the previous letter. If you start the first loop with the index variable J, the J information is pushed onto the stack. Then, when you start the K loop, the K information is pushed on top of the stack. The NEXT K must come before the NEXT J, because the loop information for K is higher on the stack.

Subroutines also use the stack. When GOSUB 200 (line 30) executes, the 128 has to remember where to come back to when the subroutine is done. The relevant information is pushed on the stack. When RETURN ends the subroutine, the computer pulls that data back and jumps back to the line after the GOSUB.

In your program, the FOR pushes some information on the stack, then the GOSUB pushes more information (which is now the top of the stack). When the NEXT occurs within the subroutine, your 128 tries to locate the information about the loop. But what it finds on the stack is the GOSUB, which isn't the right information. As a result, it stops and prints the NEXT WITHOUT FOR error.

This is not a quirk of Commodore computers. You'll find that the Apple and TI return similar error messages (the message is worded differently, but the error has the same cause).

Hidden Lines

How do you make a line number disappear when someone tries to list a BASIC program? Also, how do you make an entire line flash and then erase itself?

Mark Sanders

List the line you want to flash and add a colon, REM, and a quotation mark:

:REM"

Press RETURN and then cursor back up to the end of the line. Press CTRL-9 (RVS ON) and then type enough reverse T's to match the number of characters up to and including the quotation mark after the REM. When the line is listed to the screen, the reverse T's act as delete characters. The line prints and is quickly deleted.

This trick doesn't prevent users from listing to the printer, however, because it's not possible for printers to delete or erase characters once they've been printed on paper.

Golfing Stats

For two years I've been using a BASIC program for the 64 to calculate handicaps and keep win/loss records for my Retiree's Golf League. My problem is that the league expands to 160 players each winter and the program uses a directory entry for each man. I therefore can handle only 144 golfers on a single disk, with the records for the extras on a second disk.

Last summer I purchased a Commodore 128 with the expectation that when I bought a 1571 disk drive, it would use both sides of the disk and allow 288 directory entries. But, alas, the 1571 allows only 144 entries. So this past winter I had the same problem.

It has occurred to me that maybe there could be a way to get 288 entries by reprogramming the 1571 to use only

Font master II
Copyright (c) 1985 Xetec, Inc. All rights reserved.
xetec
$49.95

A powerful word processing system for the Commodore 64.

Includes: On screen status/help display • 30 Fonts ready to use
Font editor/creator included • BACK-UP DISK INCLUDED

From the author of *FONTMASTER* comes ***FONTMASTER II***. A vastly improved version of the AWARD-WINNING* program *FONTMASTER*. This powerful word processor, with its many different print styles (fonts), turns your dot matrix printer into a more powerful tool. Term papers, newsletters, and foreign languages are just a few of its many applications. Here are some of its capabilities:

Word Processing Features
- Over 65 powerful commands make text editing a breeze
- Headers / footers
- Page numbering in decimal or Roman
- On-screen underlining
- On-screen status-display, including pictures of font and special effects selected
- 80-column video preview
- On-screen foreign language capability (creator included)
- Form-letter / data merging
- Reads and writes either PRG or SEQ text files
- Help screens
- Right-to-left editing features for foreign languages (Hebrew, Arabic, etc.)

Word Processing Printing Features
- 47 two-letter format controls (embedded in text files)
- Fractional-character spacing used on word-wrap, justification, centering, and right alignment
- Proportional spacing (user-adjustable)
- Columnar printing (up to 4 columns)
- Overlaying of 2 or more characters (for phonetic markings, diacritics, etc.)
- 27 single-keystroke text modifiers (embedded in text files) Combine any or all of the following effects: underlining (adjustable) — more than 20 pitches — more than 50 line spacing sizes — condensed text — expanded text — boldfacing — inversion (white letters on black) — Superscripts (adjustable) — Subscripts (adjustable) — 3 text heights (micro-normal-tall)

Setup Module
- Two system setups can be made. In each the user can select his preference of colors (screen, text, border), printer interface (18 choices), and printer (over 50 choices)

Font & Character Set Creators
- Disk commands for maintenance of fonts or sets
- Grid for character creation / editing (manipulated with cursor keys, joystick, or light pen)
- Editing commands include: invert, flip, negate, shift, clear, copy
- Grid-dump to printer
- Character can be printed while editing (font creator only)

*Outstanding original programming
1985 International Summer Consumer Electronics Show

Bauhaus
Block
Bold
CELTIC
English
Futura

ΞΨζθξβΦ
Hairpin
הדקעישפסא
Italic
LED
Manhattan

rorriM
News
Print
ЧЫДёюЖЗ
Script
Shadow

±†§½□Θπ
Split
Stopbold
Tech
Typewriter
uʍopǝpᴉsd∩

...and more

xetec, Inc. • 2804 Arnold Road • Salina, KS 67401 • (913) 827-0685

one side of the disk at a time. If you could help, I'd appreciate it.

George Cowing

You're right, the 1541 and 1571 both have a limit of 144 directory entries. The directory track contains exactly 18 disk sectors and each can hold information about 8 files. Hence the 144 entry maximum.

You're also right about expanding the 1571's directory to 288 entries. The 1571 can treat double-sided disks as if they are two single-sided disks.

First, insert a new double-sided disk into the drive and type two lines:

```
OPEN15,8,15,"U0>M0"
CLOSE15
```

This makes the 1571 act like a single-sided 1541. Think of M0 as "mode zero" (M1 turns the drive back into a double-sided 1571, which is mode one). Be sure to type the 0's as zeros, not the letter O.

Even though it's using only one side, the 1571 still has two read/write heads (head 0 and head 1). Turn on head 0 and format that side of the disk with the following lines:

```
OPEN 15,8,15,"U0>H0"
PRINT#15,"N0:diskname,id"
CLOSE 15
```

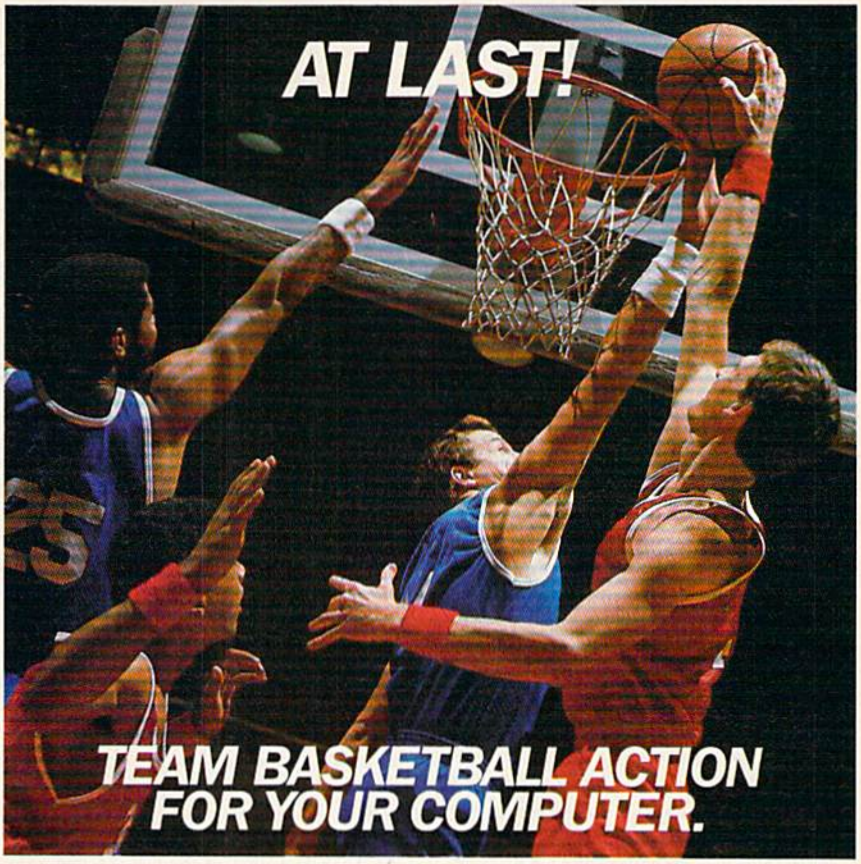
Formatting erases everything on the disk, so be sure not to use a disk containing anything you want to keep. Now type the three lines above again, but substitute "U0>H1" in the first line (this switches over to read/write head 1). Also, use a different disk name and a different ID. The different ID is essential; if you use the same ID, you may encounter some serious problems.

Once you've created the two-headed disk, you might want to mark the label so that you don't treat it as a normal double-sided disk. To use the disk in your program, you'd want to find a dividing point; for example, names A–M on one side and names N–Z on the other. Start the program with the "U0>M0" command to put it into mode 0 (1541 emulation), and then switch sides by sending "U0>H0" and "U0>H1" to channel 15.

One more thing: When you send the command to switch sides, you should not have any files open. Close all files (except the disk command channel 15) before changing read/write heads. After switching, it wouldn't hurt to initialize the disk by issuing a DCLEAR (128 mode) or a PRINT#15,"I0" (64 mode).

Safe Memory

I have a couple of questions about programs for the 64. The program "Arcade Baseball" (May) begins with POKE 56,48: POKE 55,0. What do these POKEs do? I have seen them in other programs, so they would seem to have some widespread use. When I enter them in direct mode, however, nothing


AT LAST!
TEAM BASKETBALL ACTION
FOR YOUR COMPUTER.

Two-On-Two Basketball Action

One-on-one is OK for a little practice, but real basketball is a **team** sport. To be really good at it, you need **all** the skills – passing, dribbling, shooting, stealing and rebounding. That's what it takes to win a championship. That's what **GBA Championship Basketball™: Two-on-Two™** delivers.

From the roar of the crowd to the swish of the net, from slam dunks to three-point shots, it's all here – fast and competitive.

Not only is there **team** action, but you can even compete in a 4-division, 23-team league – all the way to the playoffs and the GBA Championship game!

When you're ready to jump into the big leagues of computer basketball, start with the game that begins where the others leave off – **GBA Championship Basketball: Two-on-Two.**

GBA CHAMPIONSHIP
BASKETBALL
Two-on-Two
GAMESTAR

For Commodore 64™/128™ computer systems.

GAMESTAR

Distributed and marketed exclusively by Activision.
©1986 Activision Inc. All rights reserved.

Commodore 64 and 128 are trademarks of Commodore Electronics, Limited. Gamestar is a trademark of Activision Inc.

seems to happen.

Also, very often in machine language programs, I see the number 169 followed by the number 0. Is there some special significance to these two numbers?

Paul Dexter

When you first turn on a 64, you'll find the numbers 1 and 8 in locations 43–44 and the numbers 0 and 160 in 55–56. These numbers refer to memory addresses; to convert them into decimal notation, multiply the second number by 256, and add the first number (8 times 256 is 2048, then add 1 to get 2049). The pointer in addresses 43–44 contains the lowest address available for a BASIC program, which is 2049 ($0801 in hexadecimal notation). Locations 55–56 point to 40960 (hex $A000), one byte above the highest location available for a BASIC program. These are sometimes called the bottom of BASIC *and the* top of BASIC, *respectively.*

Locations 43–44 and 55–56 are important because they tell the computer which part of memory is not currently used by the system. Because it's free memory, you can put BASIC programs and variables in this space. After a program is loaded, another pointer at 45–46 is set. This pointer, sometimes called bottom of variables, *indicates where the BASIC program ends and variables begin. All of the memory between the bottom of variables and the top of BASIC is open; when you run a program, variables are stored here.*

This poses a problem for sprites, hires screens, custom characters, machine language (ML) programs, and anything else that needs memory. If you put an ML program in the variable space, chances are good that variables will eventually overwrite the program.

POKEing new values to 55–56 and issuing a CLR command moves the top of BASIC. The number in 56 should be lower than its usual value of 160. This reduces the memory available to BASIC programs and variables. It also sets up a section of memory that's safe from BASIC. "Arcade Baseball," for example, needs some safe space to keep the sprite shapes and custom characters.

Entering the POKEs in immediate mode might seem to have no effect. But if you type PRINT FRE(0) before and after the POKEs, you'll see a reduction in the amount of free memory. You haven't really removed any memory from the computer; you've just told it that BASIC programs must fit within a smaller amount of memory.

The 169 and 0 you've noticed in machine language programs means LDA #0 (LoaD the Accumulator with the number 0). This is a common ML instruction, one that's usually followed by a store (STA) command. To read through a machine language program, you need a disassembler, which is a program that translates numbers like 169 and 0 into corresponding, easier-to-understand mnemonics *such as LDA #0.*

Reading Alternate Disk Formats

I have trouble booting *WordStar* for the Kaypro II on my 128 and 1571. On the Kaypro, all I have to do is type WS and the program is booted. On the 128, I've tried typing WS. After about ten seconds, the disk drive stops and KAYPRO IV appears in reversed characters on the bottom of the screen. The cursor doesn't appear again until I press RETURN. Can you help?

Paul Van Beber

With certain disk formats, CP/M can't tell for sure which computer the disk came from. The KAYPRO IV prompt is essentially asking you if you're using a Kaypro IV disk. You're not, so press the right and left gray cursor keys (above INST/DEL on the top row) to select Kaypro II. Then press RETURN. If you plan to use several Kaypro II disks, you can lock in this format with CONTROL-RETURN instead of RETURN. If you do this, you don't have to select Kaypro II every time you swap disks.

For more about disk formats, type HELP while side 1 of the CP/M disk is in the drive. Select the topic C128_CP/M and subtopic MFM_FORMATS (type the back-arrow key above CONTROL to get the underline character).

Disk Flaws

I own a 64 and 1541 disk drive. When I type LOAD"$",8 on one of my disks, it prints SEARCHING and LOADING, but then the red light starts blinking. I've used this disk before and it has been formatted. What did I do wrong?

Alfred Schmalfuhs

Your letter mentions a single faulty disk. Assuming that you have other disks which work with your system, you can probably rule out the computer and disk drive as the cause of the problem. It's likely that you have a bad disk. Depending on what went wrong with it, you may or may not be able to salvage its files.

Since you can't LOAD"$" to get a directory, there may be something wrong with the directory track. Run the following program after attempting to load the directory, while the 1541's light is still flashing:

```
1 OPEN15,8,15
2 INPUT#15, E,E$,T,S: PRINT E,E$,T,S
3 CLOSE15: END
```

You should see the error number, the error message, and the track and sector where the problem occurred. If the problem is on track 18, something has happened to the directory. Initializing or validating the disk may help. First, enter this line:

```
OPEN15,8,15,"I0": CLOSE15: LOAD"$0",8
```

If that doesn't work, try this:

```
OPEN15,8,15,"V0"
```

The process of validating a disk takes some time. When the drive busy light turns off, enter **CLOSE15** *and try loading the directory again.*

The directory track may be scrambled, which means initializing and validating won't have any effect. One possible cause of a scrambled directory is misusing a program that writes directly to a disk and putting the wrong bytes in the wrong places. You may be able to fix it with a "track and sector editor" program, if you can figure out which bytes should be changed. You'd have to know how information is organized on Commodore disks and be able to recognize the bad bytes for this to work.

You may also have a magnetism problem; disks can be adversely affected by magnetism from a motor, a television, or some other electrical equipment. This is not usually something to be concerned about; the magnetism put off by most equipment is fairly weak and frequently won't have any effect on disks.

The disk itself may have a physical flaw, which could have been there when you bought it or could have been a result of improper handling (poking it with a ballpoint pen or touching the exposed disk surface, for example). If the disk is damaged, there's usually nothing you can do to repair it.

Finally, the disk may simply be stuck in its sleeve, unable to spin properly. You may have accidentally set a heavy book on top of it or squeezed too many disks into a disk box. The solution to this problem is to put two fingers in the middle of the disk and gently turn it. This should loosen it enough to allow it to spin.

If any of these suggestions help and you're able to load the directory, it would be prudent to immediately back up the files on the disk. If it failed once, it may fail again.

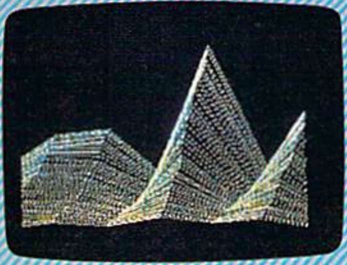
The 128 Memory Expander

I have some questions about the 1700 RAM Expansion Module I just purchased. I had hoped I would be able to address the 128K in banks 2 and 3 using the Kernal INDFET and INDSTA routines ($FF74 and $FF77) as I do with bank 1. Apparently this is not the case; the 128 thinks bank 2 is bank 0 and bank 3 is bank 1.

Is it possible to directly access the expansion memory using the techniques I use for bank 1? If not, then how do you "swap" a block of memory in machine language? If Commodore never intended to allow direct access of the

GET UP TO 200 FUN-FILLED PROGRAMS EACH YEAR–

when you subscribe now to COMPUTE!'s Gazette



LEVEL 1
TIME 139
SCORE 0
PLAYER 1
MEN

Subscribe to COMPUTE!'s Gazette today through this special introductory money-saving offer, and you'll be getting a lot more than just another computer magazine. That's because each issue of COMPUTE!'s Gazette comes complete with up to 20 all-new, action-packed programs.

Subscribe now and you can depend on a steady supply of high quality, fun-filled programs for your Commodore computer—programs like Disk Editor, Mini-Filer, Arcade Baseball, Budget Planner, Sound Designer, *SpeedScript*, and hundreds of other educational, home finance and game programs the entire family can use all year long.

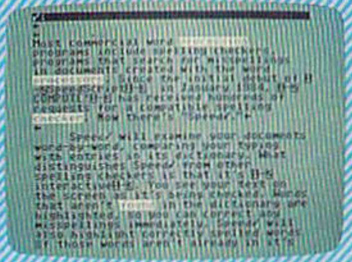
The superb programs you'll find in each issue are worth much, much more than the low subscription price.

And there's more to COMPUTE!'s Gazette than just exciting new programs. Month after month, the superb articles in COMPUTE!'s Gazette deliver the latest inside word on everything from languages to interfaces...from programming to disk drives.

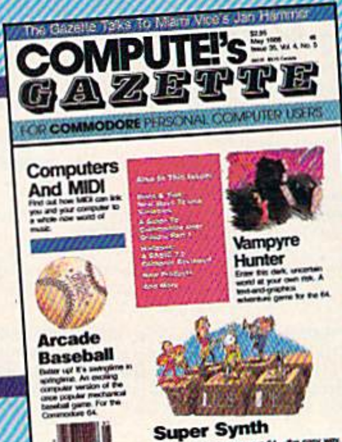
Whether you're a novice or an experienced user, COMPUTE!'s Gazette is the magazine for you. So subscribe today. Return the enclosed card or call 1-800-247-5470 (in Iowa, 1-800-532-1272).

Do it now.

HOME
INNING 2
STRIKE 1
OUT 2



ACT NOW AND SAVE!


The Gazette Talks To Miami Vice's Jan Hammer
COMPUTE!'s
GAZETTE
FOR COMMODORE PERSONAL COMPUTER USERS
Computers And MIDI
Vampyre Hunter
Arcade Baseball
Super Synth
Make great sounds on your 64—the easy way.

COMPUTE!™ Publications, Inc. abc

One of the ABC Publishing Companies

If attached order card is missing, write: COMPUTE!'s Gazette P.O. Box 10955, Des Moines, IA 50950

tcp COMMODORE

ORDERS ONLY
CALL TOLL FREE **1-800-468-9044**

Software orders over $50.00 will be shipped FEDERAL EXPRESS (yes, even with *these* prices)

You only pay TCP's standard shipping charge of $4.00 per order. This offer also valid on peripherals and accessories under 8 pounds. Orders arriving before 11:00 AM our time will be shipped out same day.*

Computerized order entry, processing and status allow TCP to serve you faster and better!

- If through some oversight we don't have the lowest price, we would appreciate the opportunity to beat it. If we can, you will still get the benefit of our Federal Express shipping on software orders over $100.00
- We accept MasterCard, Visa, COD and mail orders.
- Purchase orders accepted from qualified corporations and institutions. Minimum order of $500.00 required.
- No sales tax on orders outside PA
- Buy with confidence. We honor manufacturer's warranty.

To order by mail: We accept money order, certified check, personal check. Allow 2 weeks for personal check to clear.
Shipping: $4.00 for software and accessories/$10.00 for printers and color monitors/$8.00 for disk drives and other monitors/Add $3.00 per box shipped COD. Call for other shipping charges. Additional shipping required on APO, FPO, AK, HI, and foreign orders.

Terms: ALL PRICES REFLECT CASH DISCOUNT, ADD 1.9% FOR MASTERCARD OR VISA. Manufacturer's warranty honored with copy of our invoice. **ALL SALES ARE FINAL.** Defective items replaced or repaired at our discretion. Pennsylvania residents add 6% sales tax. Prices and terms subject to change without notice.

DATA 20 XL-80

The XL-80 is an 80 column board that plugs into the back of your C-64. It's **compatible with the Mitey Mo** modem software to give you an 80 column terminal on your C-64. Included with the XL-80 is an 80 column word processor, spreadsheet, and mailing list program.

XL-80
$59.95

XL-80 & MITEY MO Package Deal
$107.95

CMS

General Acct System

for the C128 in 128 mode
Includes ☐ General Ledger ☐ Accts Receivable ☐ Billing Statements ☐ Accts Payable ☐ Check Writing ☐ Job Costing ☐ Payroll

TOTAL PRICE **$134.95**

JUKI

PRINTER/TYPEWRITER

2200 .... $264
Daisywheel Printer, Portable Typewriter, Built in Correction Tape

PRINTERS

6000P	$CALL
6100P	$344

CLOSEOUT SPECIAL!!

Wordpro 3+/64

$14.95

while supply lasts

MODEMS – MODEMS – MODEMS

MESSENGER	$42.95
VOLKS 6470 300/1200 BAUD	$154.95
1670	$157.95
1660	$CALL
MITEY MO	$59.95
VIP TERMINAL	$34.95
VIDTEX TERMINAL	$23.95
Compuserve Starter Kit	$19.95
Playnet Starter Kit	$14.95

MASTER MODEM $39.95
Includes Dow Jones, Compuserve Time

PRINTER INTERFACES

G-WIZ	$49.95
MW-350 w/4K Buffer	$CALL
Cardco Super G...	$CALL
Xetec Supergraphix	$CALL
Xetec Jr.	$46.95
Grappler CD	$87.95
Tymac Connection	$67.95

PRO·LINE SOFTWARE

GT4 .... $22.95
Fast Save, Fast Load Cartridge

C POWER C COMPILER	$69.99
CADPIC	$36.95
CASHBOX	$36.95
Wordpro 64	$36.95
Spellpro 64	$32.95
Mailpro 64	$24.95
Profile 64	$36.95
PAL 64	$32.95
POWER 64	$32.95
TOOLBOX 64	$59.95

SAT Preparation With HAYDEN

Prepared by Professionals

SAT Score Improvement System $59.95
Includes Preparation for Math, Reading comp., Vocabulary, Quantitative Comparisons, and Word problems

SAT Practice Test $17.95

EPSON

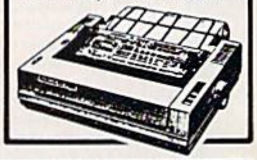
LX-80	$229
LX-80 tractorfeed	$CALL
Homewriter 10 includes Commodore or Atari interface	$CALL
FX-85	$359
FX-286	$CALL
DX-10	$CALL

The Print Shop

Broderbund Print Shop	$25.95
Print Shop Companion	$CALL
Graphics Library I, II or III	$16.95
120 sheet color paper refill ⅓ red, ⅓ blue, ⅓ gold	$8.95

PANASONIC

1091	$229.00
1080	$199.00
1092	$CALL
1592	$CALL
3131 Daisywheel	$CALL
3151 Daisywheel	$CALL



PRINTER PACKAGES

all packages work with C64 or C128

star

NX-10 & Xetec Supergraphix	$309.95
NX-10 & Xetec Supergraphix jr.	$284.95

PANASONIC

1091 & Xetec Supergraphix	$289.95
1080 & Xetec Supergraphix jr.	$239.95

Packages Available! All printers/interfaces...call for details!

We are a Commodore authorized service center

Out of warranty repair rates:

C-64	$69.95
1541	$79.95
C-128, 1571	$CALL
1541, 1571 align	$29.95

prices include all parts and labor, 30 day warranty, and UPS return ground shipping

Printer Closeouts!

NEC 8027A
105 CPS, Friction and tractor feed
Works with Print Shop!
$139

cardco
LQI Daisywheel
$179

tcp TUSSEY COMPUTER PRODUCTS
P.O. BOX 1006
STATE COLLEGE, PA 16804

128 CLASSIFIEDS

INFORMATION AND PA ORDERS 814-234-2236

OPEN 9-8 Mon-Fri; 10-5 Sat EAST COAST TIME

GAMES

BEST SELLING GAMES

Hitchhiker's guide	$22.95
F-15 Strike Eagle	$21.95
Karateka	$19.95
Kung Fu (Spinnaker)	$call
Flight Simulator II	$32.95
FS II Scenery disks	$15.95
Jet	$29.95
Microleague Baseball	$27.95
Microleague general manager disk	$27.95
Microleague 1985 teams	$15.95
Hobbit	$call
Sargon III	$37.95
Murder by the Dozen	$24.95

ACTIVISION

Alcazar	$19.95
Borrowed Time	$19.95
Computer Fireworks Celebration	$19.95
Countdown to shutdown	$19.95
Fast Tracks Slot Car Const	$19.95
Garry Kitchen's Gamemaker	$24.95
Great Amer RR	$22.95
Hacker	$19.95
Little Computer People	$24.95
Master Of Lamps	$19.95
Mindshadow	$19.95
Pitfall II: Lost Caverns	$19.95
Space Shuttle	$19.95

BRODERBUND

Championship Lode Runner	$24.95
Karateka	$19.95
Lode Runner	$24.95
Music Shop	$29.95

BLUE CHIP

Baron	$24.95
Millionaire	$24.95
Tycoon	$24.95

ELECTRONIC ARTS

CALL FOR OUR LOW PRICE ON ALL ELECTRONIC ARTS PRODUCTS!!

EPYX

Summer Games	$26.95
Summer Games II	$26.95
Winter Games	$27.95
Vorpal fast loader	$call

Call for prices on other EPYX products!!!

INFOCOM

Cut Throats	$22.95
Deadline	$25.95
Enchanter	$25.95
Hitchhiker's Guide	$22.95
Infidel	$29.95
Invisiclues	$6.95
Planetfall	$25.95
Sorcerer	$29.95
Spellbreaker	$29.95
Suspect	$29.95
Wishbringer	$25.95
Witness	$25.95
Zork I	$22.95
Zork II	$26.95
Zork III	$26.95

MINDSCAPE

Bank Street Music Writer	$27.95
Bank Street Storybook	$27.95
Castle Clobber	$18.95
Halley Project	$27.95
Indiana Jones	$22.95
Quake minus one	$17.95
Shadowfire	$17.95
The Perfect Score: Prep for Sat	$49.95
The Lords of Midnight	$17.95

CALL FOR PRICING ON OTHER MINDSCAPE PRODUCTS

MICROPROSE

Acrojet	$24.95
Crusade in Europe	$27.95
Decision in the Desert	$27.95
F-15 Strike Eagle	$21.95
Gunship	$24.95
Conflict in Vietnam	$call
Hellcat Ace	$21.95
Kennedy Approach	$24.95
NATO Commander	$24.95
Silent Service	$24.95
Solo Flight	$24.95
Spitfire Ace	$21.95
Top Secret	$24.95

SIMON & SHUSTER

G.I. Paper Airplane const	$call
JK Lasser's Income Tax guide	$39.95
Kermit's Story Maker	$19.95
NY Times Crossword Puzzle Vol. 1 or 2	$14.95
Spy Hunter	$31.95
Star Trek-Kobayashi alt	$29.95
Typing Tutor III	$29.95

SPINNAKER

Adventure Creator	$22.95
Alphabet Zoo	$16.95
Cosmic Combat	$call
Delta Drawing	$19.95
Facemaker	$19.95
Hey Diddle Diddle	$16.95
Homework Helper	$call
In search of the most amazing thing	$18.95
Kung Fu	$CALL
Snooper Troops I or II	$18.95

Call for Prices on other SPINNAKER Software

STRATEGIC SIMULATIONS

CALL FOR OUR LOW PRICE ON ALL SSI GAMES

MISCELLANEOUS

C-64 WORD PROCESSORS

Paperback Writer	$call
Bank Street Writer	$call
Bank Street Speller	$34.95
Font Master II	$34.95
Wordpro 64	$36.95
Spellpro 64	$32.95
Wordpro 3 + /64	$19.95
Fleet System II	$call
Paperclip	$37.95
Paperclip w/spellpack	$49.95
Mirage Professional WP	$36.95
Trio	$call
Kid Pro Qyo	$32.95

C-64 DATABASES

Bank Street Filer	$34.95
Consultant	$39.95
Mirage Database w/Report gen	$36.95
Profil 64	$36.95
File Now	$call
Practifile	$call

C-64 SPREADSHEETS

Vizastar 64	$79.95
Pracitcal(d) or (t)	$call
Calkit	$39.95
Hes Multiplan	$29.95
PS, The Programmable Spreadsheet	$19.95
Calc Result Adv (d,c)	$67.00

MONOCHROME MONITORS

(Composite Input)

NEC 1205 12" amber w/sound	$89.95
Goldstar MBM2233 12" amber	$79.95
Goldstar 12" green	$79.95
Zenith 1220 amber flat screen	$99.95
Zenith 1230 green flat screen	$99.95
Din to RCA phono jack cable	$6.95
RGB to RCA phono jack cable	$9.95

COLOR MONITORS

SAMSUNG 14" Color composite	$139.00
Taxan 220 Color composite, sep. video	$169.00
Sakata SC-100	$149.00

CARDCO

Numeric keypad	$34.95
5 slot cart. exp	$54.95
S'more Basic	$49.95

UTILITIES

Merlin 64	$34.95
Fast Load	$24.95
Pal 64	$32.95
Power 64	$32.95
Toolbox 64	$59.95
CSM 1541 align	$34.95
Mach 128	$call
C Power	$69.95

C-64 INTEGRATED PACKAGES

Vizastar 8K	$79.95
Trio	$call
Homepack	$39.95

MISCELLANEOUS

Estes power supply for C-64	$CALL
Koalapad	$59.95
Koala Gibson Light pen	$49.95
Naverone 3 Slot expander	$27.95

GRAPHICS

Print Shop	$25.95
Graphics Library I, II, or III	$16.95
Newsroom	$34.95
Clip Art I	$19.95
Clip Art II	$call

Financial & Accounting

Softsync Pers. Acct	$32.95
Cont. Home Acct.	$46.95
Timeworks General Ledger, A/R, A/P, Payroll, Inventory	$40.95 each
Infodesigns General ledger, A/P, A/R, Payroll, Inventory	$call
Cashbox	$36.95

ACCESS

HAYDEN

CALL FOR OUR LOW PRICE ON ALL ACCESS AND HAYDEN PRODUCTS!!

COMMODORE 128

HARDWARE

1670....$157.95

C128
1571, 1572 DRIVES
1902 MONITOR
MPS 1000 PRINTER
1350 MOUSE
1700, 1750 RAM EXPANSION

CALL NOW FOR LOWEST PRICES

SAVE A BUNDLE ON A BUNDLE
PACKAGE DEALS AVAILABLE
CALL FOR DETAILS

COMMODORE SOFTWARE

WORD PROCESSORS

VIZAWRITE 128	$LOWEST PRICE CALL
WORDPRO 128	$59.95
PAPERCLIP	$37.95
PAPERCLIP W/SPELLPACK	$49.95
WORD WRITER 128 W/SPELLER	$49.95
PERFECT WRITER	$CALL
Paperback Writer 128	$call

SPREADSHEETS

EPYX. MULTIPLAN 128	$44.95
PERFECT CALC	$CALL
SWIFTCALC 128 W/SIDEWAYS	$49.95
VIZASTAR 128 Integrated Spreadsheet, Database, Graphics	$CALL

MISCELLANEOUS 128 SOFTWARE

PERFECT FILER	$CALL
JANE	$32.95
SUPERBASE 128	$69.95
CONSULTANT 128	$39.95
Sylvia Porter's Financial Planner	$CALL
Data Manager II	$49.95
Mach 128 from Access	$34.95

NEW TITLES EVERY DAY!
CALL FOR LATEST INFORMATION!

A NEW STAR IS BORN!

NX-10 call for price & details

SL-10C or SG-10C	$226

Commodore ready

SG-15	$364
SD-10	$323
SD-15	$449
POWERTYPE	$229

18cps daisywheel

SR-10, SR-15	$CALL

star MICRONICS·INC

ENHANCER 2000

$159 DISK DRIVE

1 YEAR WARRANTY

RGBi/COMPOSITE MONITORS

Magnavox 8562 ... $CALL
2 year warranty, all cables to 128 included. Monochrome mode available at flick of switch

Thompson Monitor $CALL
4 modes of operation. All cables to 128 included.

SEIKOSHA

SP-1000 VC $179
Commodore ready, NLQ mode, friction and tractor feed standard.

SP-1000.......$CALL
Centronics parallel version of above printer

XETEC inc.

SUPER GRAPHIX interface w 8K buffer, down loadable fonts
$ lowest price

SUPERGRAPHIX jr printer interface. . $46.95

Font Master II . $34.95

COMREX

CR6550
13" Color Composite Monitor w/sound
2 yr warranty from Comrex, a division of Epson
$129.00 Best Value in Color Monitors

ORDERS ONLY...CALL TOLL FREE **1-800-468-9044**

tcp

RAM expansion, why was the MMU designed to handle bank 2 and 3 configurations?

Richard W. Irwin

It's not possible to directly PEEK and POKE the expansion memory; a form of loading and saving is necessary. Here are the procedures for using the memory from BASIC, CP/M, and machine language:

BASIC commands to access the 1700 or 1750 include FETCH, STASH, and SWAP. For example, **BANK0:STASH 1000,1024,1,2000** *saves the current 40-column screen to locations 67536–68535 in the expander. The BANK command at the beginning of the line sets the current bank to zero (where screen memory is found). The four numbers following STASH are the number of bytes to store, the starting address in the 128's memory, the bank inside the memory expander, and the address inside the expander. To retrieve the screen you saved, substitute FETCH for STASH. Note the two sets of addresses, one for memory in the 128 and one for memory in the expander.*

To specify a location in memory expansion, you must include a bank and an address (banks in the 1700 and 1750 are independent of the banks inside the 128). The memory address can be a number from 0 to 65535. The 1700 (128K) expander has two banks, numbers 0–1. The 1750 (512K) has eight, 0–7. When you STASH a large number of bytes to the end of a bank, the overflow will automatically wrap around to the beginning of the next bank.

From CP/M mode you can treat the expander as if it were a very fast disk drive, called drive M:. After you PIP (copy) programs and files to drive M:, the time to load a file is almost instantaneous. Making disk backups is also easy. You PIP a disk to the expander, insert a formatted disk, and PIP everything to the backup disk.

Accessing the memory expander in machine language is similar to the way you do it in BASIC. Several registers for the expander can be found at locations $DF00–DF0A in bank 15. After switching to bank 15 by storing a zero into $FF00, write to the following addresses:

$DF02–03:	*Low-byte and high-byte of the starting address in the 128.*
$DF04–05:	*Memory address (0–65535) in the expander.*
$DF06:	*Bank number (0–1 or 0–7, depending on the memory size of the expander).*
$DF07–08:	*Number of bytes to send or receive.*

All numbers are stored low-byte first. When everything is set up, load the X register with the bank you want to access in the 128, and load Y with the command. Use $80 for STASH, $81 for FETCH, $82 for SWAP, and $83 for verify (after verifying, bit 5 of $DF00 will be cleared to zero to indicate a successful verify). When all this is done, JSR to the Kernal routine DMA_CALL at location $FF50. While the memory expansion is being used, the 8502 will be put in a "wait" state, during which no ML instructions will be executed. Two warnings: First, stay away from the I/O area ($FD000–FDFFF) in the 128; attempting to store to bank 0 or bank 1 may result in bad values being written to the VIC chip or one of the CIA chips. Second, the 128 should be running at 1 megahertz (SLOW mode). FAST mode may affect the timing of the memory transfer.

To answer your other question: The 128's nonexistent banks 2 and 3 are mentioned in some Commodore technical notes as provisions for future upgrades (the Commodore 256, perhaps?). There's no indication at this time that Commodore plans to develop or market such a machine, but it's a possibility.

Array Variables

I'm writing a program that chooses random numbers in a FOR-NEXT loop and prints them in various ways. But the numbers always turn out to be zero. Here's part of my program:

```
10 FOR A = 1 TO 2
20 B(A) = INT (RND(1) * 10 +1): NEXT
30 PRINT B1; "+"; B2;: INPUT C
```

Of course, my program is more advanced than this, but this seems to be where the bug is located. Could you please tell me what's wrong and why?

Uzair Hameed Ismail

Your program is correct up to a point. The FOR-NEXT loop assigns random numbers between one and ten to array variables B(1) and B(2). But when you print the variables in line 30, you're using the wrong variable names. It should look like this:

```
30 PRINT B(1); "+"; B(2);: INPUT C
```

Note the parentheses around the numbers. Variables B(1) and B(2) are part of an array (a list of variables), while variables B1 and B2 are ordinary scalar *variables (independent variables not connected with a list). Because you used B(A) in line 20, you should use B(1) and B(2) in line 30.*

The reason you see all those zeros is that undefined numeric variables are assigned the value 0 when you use them in a program. Your program hadn't done anything with B1 or B2 before line 30, so the computer assumes you want them to equal zero.

The 128's Keypad

In a program for the 128, how can you tell if a number was typed on the keypad to the right or by the number keys above the normal keyboard?

Kurt Hindenburg

If you INPUT, GET, or GETKEY, you won't be able to tell the difference between the numeric keys to the right and the numbers above the keyboard. When you're retrieving characters, a 5 is a 5, no matter where you type it. There is a way to check for the two different sets of keys, however. Try running the following program:

```
10 DO: PRINT PEEK(213);: LOOP
```

Press the number keys, and you'll see that the keypad produces numbers that are different from the numbered keys in the top row of the regular keyboard. Location 213 holds the keyscan code *for the key currently being pressed (or the value 88 if no key is pressed). Keyscan codes are different from either screen or character codes, so the numbers printed on the screen might not seem to be in a logical order, but there's an internal logic based on the way the keyboard is wired. For more about keyscan codes and redefining the keyboard, see the "KeyDef" article elsewhere in this issue.*

Machine Language Patterns

Is there any correlation between the 6502/6510 opcode bit patterns and their addressing modes? I have written a disassembler in machine language that requires two large tables to decode the opcodes. If the opcodes hold certain addressing information, I could optimize the program dramatically.

Rick Nash

If you examine a sorted list of hexadecimal opcodes, you'll see some definite patterns (such a list can be found in the Programmer's Reference Guide for the 64*). If the lower nybble is 1 ($01, 11, 21, up to $F1), the operation is either indirect-X or indirect-Y. Breaking it down further, all indirect-Y operations have a bit pattern of xxx00001, and all indirect-X operations are xxx10001 (where xxx could be any pattern of on or off bits).*

Opcodes with a lower nybble of $8 are all one-byte operations (implied addressing mode). So xxxx1000 includes PHP, PLP, PHA, CLC, SEC, CLI, SEI, and other one-byte instructions. All of the load opcodes, including LDA, LDX, and LDY have a pattern of 101xxxxx, a high nybble of either $A or $B. Many other correlations can be discovered if you study the list.

Knowing the patterns may not speed up your disassembler or reduce the amount of memory it needs, however. You may find that using a lookup table is faster and more efficient. If it's any comfort, popular monitor programs like Supermon, *VICMON, and the Commodore 128's built-in monitor all use tables rather than mathematical algorithms to disassemble opcodes.*

The #1 DISK UTILITY FOR OVER A YEAR, STAYS #1!

FAST HACK'EM

FOR THE COMMODORE 64/128

SINGLE 1541/71
- Back-up all standard disks in less than 2 minutes.
- Using a C-128 and 1571 in 128 mode, copies top or bottom side in only 70 seconds!
- Fast file copier. Copies a 100 block file in 20 seconds! Formats a disk in 8 seconds!
- Nibble a protected disk in just over 2 minutes, tracks 1-40.

TWO 1541/71's
- Back-up a standard disk in only 35 seconds!
- Nibble a protected disk in under 60 seconds, tracks 1-40.
- Equipped with Special Auto-Backup**

MSD DUAL DRIVE
- Automatic Backup of nearly all protected disks in 70 seconds!
- Also equipped with Special Auto-Backup**

- Built-in FASTBOOT. Can be used to load other programs up to 7 times faster than normal.
- Also included is an extensive 28-page documentation manual.

NOW SHIPPING V3.0

EASY TO USE
ALL VERSIONS ON ONE DISK

ONLY $29.95
ADD $3.00 SHIPPING

What sets Fast Hack'em apart from our nibbling competition:

It's called a Parameter Copier. By using special copy parameters that tell the nibbler how to either copy or remove protection from a particular disk, programs that would normally be impossible for any nibbler to ever copy are easily backed-up by Fast Hack'em.

Parameter updates of 25 to 30 new parameters are released bi-monthly and are $6.00. Major disk updates will be announced when available and are $12.00 + original disk.

Check, Money Order, **VISA, MASTERCARD** Accepted
Add $3.00 for C.O.D.'s

Dealer Inquiries Welcome!

****SPECIAL**
Auto-Back-up After booting up, the computer is no longer necessary, and may be disconnected. The drives automatically detect the disk being inserted and removed. An absolute must for multiple back-ups!!!
All routines are highly reliable and include full verify option.

BASEMENT BOYS SOFTWARE
P.O. Box 30901 Portland, OR 97230-0901
(503) 256-5506

Have your C-128* look as smart as it works...

with the Command Center, a space saving cabinet specially designed for the C-128 Personal Computer System. Just install your keyboard and disk drives, set your CRT on top, and you've got Commodore value with the look of a much more expensive system.

It will untangle your wires and unclutter your desk. And look at all it includes:

- **Built-in AC Power Strip** with surge protection and line noise filtering.
- **Built-in Drive/CPU Cooling Fan.**
- **Phone/Modem telecommunications switch.**
- **Master A.C. Switch** with power indicator light.

Free 30-day trial offer and one year warranty. Order your Command Center today. Write: KETEK, P.O. Box 203, Oakdale, IA 52319.

For faster service, call 1-800-626-4582 toll-free.

The Command Center consolidates all these peripherals.

Built-in features include power strip, fan and phone plug.

$149.95

*C-128 is a registered Trademark of Commodore Business Machines.

KETEK, P.O. Box 203, Oakdale, IA 52319

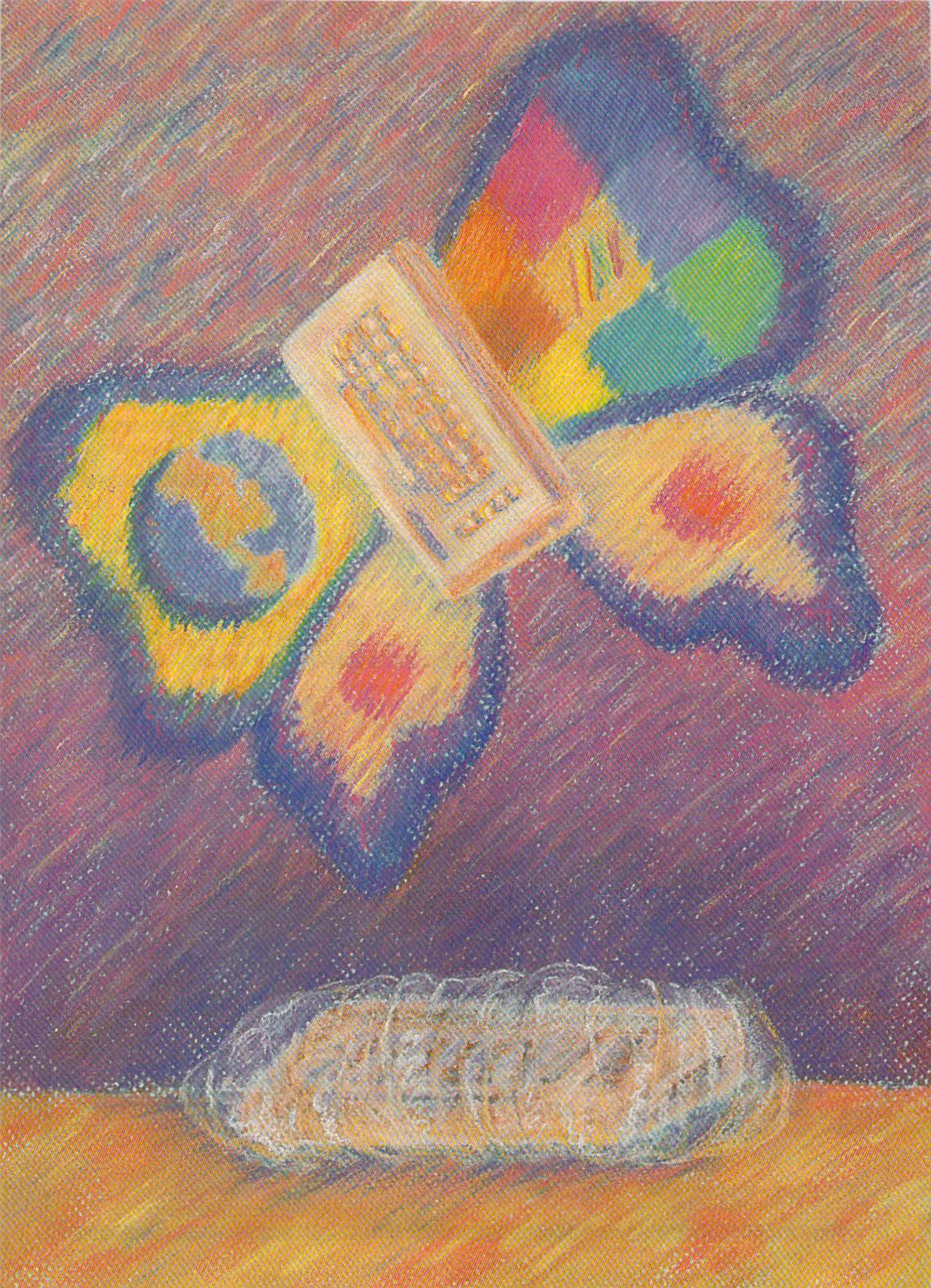
YES! Rush me a Command Center to complete my C-128 system. I may enjoy it for up to 30 days and return it for a full refund. Enclosed is my check or money order for $153.45 ($149.95 plus $3.50 for shipping and handling).

Name ______________________

Address ______________________

City ____________ State ________ Zip ________

DEALER INQUIRIES INVITED



THE 64C

A NEW LOOK FOR AN OLD FRIEND

Selby Bateman, Features Editor

The ever-popular Commodore 64 is undergoing the first major change in its four-and-a-half-year history: encased in a cream-colored 128-style shell, and sold with a new disk-based icon-oriented operating system featuring a built-in word processor and paint program. Commodore is also placing a major emphasis on telecommunications for the 64C through the QuantumLink online service. For several million 64 and 128 owners, the good news is that Commodore plans to continue supporting the 64 for quite some time.

If you can't beat them, join them.

That's apparently Commodore's philosophy as the company rolls out the new Commodore 64C computer. At least twice Commodore stopped production of the 64 in late 1985, only to be forced back to the assembly line by high numbers of orders for the machine. And a Commodore official says that the 64 was still backordered during the first quarter of 1986. So, rather than try to fight success, Commodore hopes the repackaged and refurbished 64 will continue its reign as the king of low-cost computers for the rest of 1986, into 1987, and—who knows?

Announced at the Consumer Electronics Show (CES) in Chicago June 1–4, the Commodore 64C represents a major new direction for Commodore, which had been emphasizing the higher priced 16-bit Amiga computer and the popular 128 in place of the 64. But now, like the U.S. Statue of Liberty, the 64 is getting a major facelift and a new lease on life. Commodore says that the 64C should begin to be available about the time you read this.

For producers of 64 software, Commodore's altered marketing strategy means two important things. First, that the present installed base of more than two-and-a-half million 64s will continue to grow rather than be orphaned by Commodore, giving those companies further reason to keep producing 64 software. And second, the new GEOS (Graphic Environment Operating System) software to be bundled with the 64C, and sold separately to current 64 owners, will provide an entirely new software universe for the computer.

Similar to the Commodore 128 in its low-slung architecture and cream color, the new 64C is the same 64 internally. Its keyboard, side and rear ports, and switches are also identical to the 64's. The ROM-based operating system hasn't been changed either. So, all 64 software will be 100-percent compatible.

NEW HOURS!
Mon-Thur 9AM-8PM
Fri 9AM-6PM
Sat 10AM-6PM

LYCO COMPUTER MARKETING & CONSULTANTS

NEW HOURS!
Mon-Thur 9AM-8PM
Fri 9AM-6PM
Sat 10AM-6PM

TOLL FREE 1 800 233 8760

"WE MAKE YOUR COMPUTER FUN TO USE!"

DUST COVERS

Atari

520ST	11.95
130XE	6.99
800XL	6.99
1050	6.99
1025	7.99

Commodore

C128	7.99
1571/1541	6.99
1902	10.95
1702	8.99
C64/Vic20	6.99

Panasonic

1090/1091	8.99
1092	8.99
1093	9.99

Star Micronics

SG/SD10	8.99
SG/SD15	9.99
SR10	9.99
SR15	9.99

Okidata

82/92	8.99
83/93	9.99
193	9.99

INNOVATIVE CONCEPTS

Flip-N-File 10	2.49
Flip-N-File 25 Lock	10.95
Flip-N-File 50 Mini	10.95
Flip-N-File 50 Lock	15.95
Flip-N-File ROM	7.99

EPYX-64

Fastload	24.75
Summer Games	26.75

SUNCOM

SLICK STICK	7.95
TAC 3	11.99

WICO Joysticks

15-9714 Bat Handle	16.75
50-2030 Boss	11.99
50-2002 Super 3-Way	19.99

COMMODORE

128	CALL
C 1571 Drive	CALL
C 1902-A	CALL
C 1541 Drive	CALL
C 1670 Modem	CALL
C 1350 Mouse	39
C 1700 128 K RAM	145
C 1750 512 K RAM	269
JANE	35
Perfect Writer	45
Perfect Calc	45
Perfect Filer	45

UNISON WORLD

Print Master (Amiga)	22.75
Print Master (C-128)	22.75
Print Master (C-64)	22.75
Art Gallery	16.75

ACTIVISION (C-64/128)

Alter Ego	28.75
Hackler	18.75
Little People	20.75
Gamemaker	24.75
Borrowed Time	18.75
Space Shuttle	18.75
Music Studio	***24.75***
Mindshadow	18.75
Roadrace	18.75
Fast Tracks	22.75
Count Down	18.75

BATTERIES INCLUDED

Paper Clip	35.95
Consultant	35.95
Paper clip w/ Spell Pak	48.95

MICROLEAGUE

Baseball	24.95
GM Disk	24.95
Team Disk	14.95
Stat Disk	14.95

SYNAPSE

Syncalc	29.95
Template	14.95
Loderunner Rescue	19.95
Essex	24.95
Brimstone	24.95
Mindwheel	24.95

BRODERBUND

The Print Shop	24.75
Graphics Library I, II, III	15.75
Karateka	17.75
Bank St. Writer	29.75
Lode Runner	19.75
Printshop Companion	24.75
Bank St. Speller	29.75
Bank St. Filer	29.75
Bank St. Mailer	29.75
Championship Loderunner	19.75

SUBLOGIC

Nightmission Pinball	18.95
Flight Simulator	31.75
Jet Simulator	25.95
Football	25.95
Scenery Disk	EA. 14.95
Set 1-6	69.95

ACTIVISION (Amiga)

Hackler	26.75
Mind Shadow	26.75
Music Studio	***29.75***
Borrowed Time	26.75

VIP (Amiga)

VIP Professional	119.95

ACCESS (C-64—Amiga)

Leader Board	24.75
Leader Board Amiga	24.75
Tournament I	12.75
MACH 128	28.75

CARDCO

Numeric Keypad	34.95
CB/5 5-slot Board	49.95
CB/2 2-slot Board	21.95
S'More Basic Rom	39.95
Write Now	29.95
Freeze Frame	29.95

XETEC

Font Master II 64	28.95

SSI

Colonial Conquest	22.75
Wings of War	22.75
Computer Ambush	32.75
Field of Fire	22.75
Fighter Command	34.75
Kampfgruppe	34.75
Mech Brigade	34.75
Market Garden	27.75
Six Gun Shootout	22.75
Computer Baseball	22.75
Computer Quarterback	22.75
Imperium Galactum	22.75
Phantasie	22.75
Cartels & Cutthroats	22.75
50 Mission Crush	22.75
Questron	22.75
Gemstone Warrior	22.75
Battellion Commander	22.75
Panzer Grenider	22.75
Norway 85	22.75
U.S.A.A.F.	34.75
Battlegroup	34.75
NAM	22.75
Phantasie II	22.75
Wizards Crown	22.75
Rings of Zelphin	22.75

CONTINENTAL

Home Accountant	39.95
Book of Adventure Games I, II	14.95

DISK DRIVE CLEANING KIT

$8.95

With Software

$17.95

Summer Blow Out
Koala $155
Supersketch $19.95

Buy Lyco and Enjoy

★ THE LOWEST PRICES ★ TOLL FREE ORDER LINE ★

★ Free shipping on prepaid cash orders in U.S. ★ All Merchandise Factory Fresh ★ Fast Service from one of the oldest and most established Computer Supplier ★ 24 hrs. shipping on in-stock product ★ Access to our Multi Million $ inventory ★ No deposit on UPS C.O.D. orders ★ Orders outside PA Save state sales tax ★ Air freight service available ★ Full Manufacturer's Warranty apply! ★ Full accessory line in stock ★ Purchase orders Accepted from educational institutions! ★ We check for stolen credit cards! ★ We ship to our servicemen overseas! ★ You'll love our Courteous Sales Staff! ★ We satisfy more customers monthly than most of our competitors combined ★

NEW HOURS!
Mon-Thur 9AM-8PM
Fri 9AM-6PM
Sat 10AM-6PM

NEW HOURS!
Mon-Thur 9AM-8PM
Fri 9AM-6PM
Sat 10AM-6PM

LYCO COMPUTER MARKETING & CONSULTANTS

EPSON

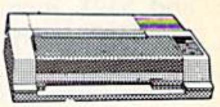
LX80	209
FX85	369
DX10	207
HI80	355
HS80	298
FX286	529
LQ800	529
LQ1000	659

LEGEND

1080	Call
1380	258
1385	289
808	148

C. ITOH

1550 SP+	Call
D1040	Call
Prowriter Jr.	Call
Prowriter 8510 SP+	Call



SILVER REED

EXP 420 P	209
EXP 600 P	489
EXP 800 P	649

BROTHER

HR-15XL-P	359
HR-15XL-S	359

TOSHIBA

P1340	469
P351+	1149
P341P	969
P341S	999
351 Sheet Feeder	529

DIABLO

D25	549
D80 1 F	2395
P 32 CQ 1	699
P-38	1749
C-150	999
635	1029

JUKI

Juki 6100	339
RS232 Serial Board	55
6100 Tractor	119
6100 Sheet Feeder	209
Juki 6300	757

1080 .....$199

SAVE ON THESE IN STOCK PRINTERS

NX-10....CALL

PANASONIC

1080	199
1091	228
1092	325
3131	257
3151	399
1592	439
1595	NEW

SILVER REED

EXP400	249
EXP500	295
EXP550	399
EXP770	749

SEIKOSHA

SP-1000 VC (C-64)	185
SP-1000 A Centronics	197
SP-1000 I IBM	197
SP-1000 AS RS-232	197
SP-1000 AP Apple IIc	197
BP-5200 I	649
SP-1000 ribbon	8.50
BP-5200 ribbon	12.50
BP-5420	999

OKIDATA

Okimate 10	179
182	214
192	348
193	563

CITIZEN

MSP-10	268
MSP-15	377
MSP-20	355
MSP-25	528
120-D	195
Premier 35	469

STAR MICRONICS

NX-10 (NEW)	CALL
NB-15 (NEW)	CALL
SB-15 (NEW)	CALL
SG-15	367
SD-10	319
SD-15	438
SR-10	469
SR-15	578
SB-10	589
Powertype	297

COLOR RIBBONS AVAILABLE!

MONITORS

AMDEK

300 Green	115
300 Amber	125
310 RGB	143
710	439
725	Call
730	Call
722	Call

ZENITH

ZVM 1220	95
ZVM 1230	95
ZVM 1240	149

PRINCETON GRAPHICS

MAX-12 Amber	175
HX-12 RGB	458
SR-12 RGB	575

COMMODORE

1902 Color	CALL
1802 Color	CALL

AMDEK

300 Green	118
300 Amber	128

THOMSON

CM36512V1	269
CM36632	159

TEKNIKA

MJ-10	175
MJ-22	250
MS-305 RGB	NEW

SAKATA

SG 1000 12" Green	99
SA 1000 12" Amber	109
SG 1500 12" Green TTL	119
SA 1500 12" Amber TTL	129
STS1 Tilt stand	29

DRIVES

COMMODORE

1571	CALL
1541	CALL

INDUS

GT Commodore	185

COMTEL

Enhancer 2000 (C-64)	155

DISKETTES

VERBATIM

5¼" SSDD	9.99
5¼" DSDD	13.99

BONUS

5¼" SSDD	6.99
5¼" DSDD	8.99

MAXELL

5¼" SSDD	11.99
5¼" DSDD	15.99

SUNKYOUNG

SKC 5¼" SSDD	11.99
SKC 5¼" DSDD	13.99

INTERFACING

XETEC

Super Graphix 64	64
Super Graphix JR 64	45

ORANGE MICRO

Grappler CD (C-64)	79

CARDCO

G-WIZ (C-64)	47.95
Super G (C-64)	54
C/?PS (C-64)	37

TYMAC

Connection (C-64)	55

MODEMS

HAYES

Smartmodem 300	133
Smartmodem 1200	377
Smartmodem 1200B	347
Smartmodem 2400	598

COMMODORE

1670 Modem	155

SUPRA

1064 Modem (C-64)	49.95

US ROBOTICS

Password 1200M	229
Password 1200F	229
Password 300M	139
Password 300F	139

TOLL FREE 1-800-233-8760

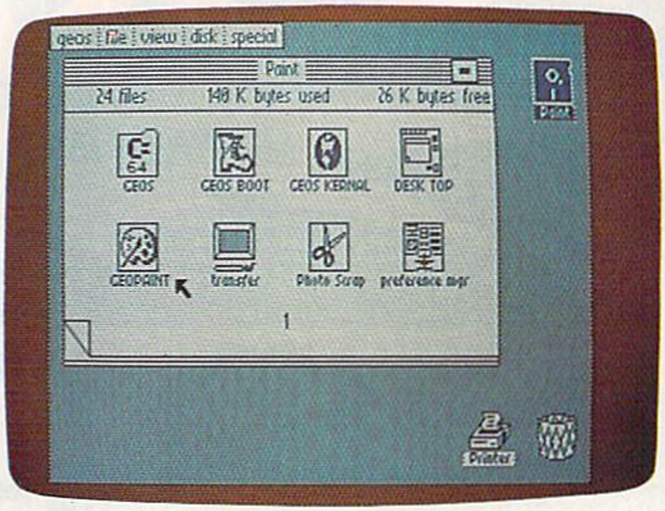
TO ORDER

CALL TOLL FREE 1-800-233-8760
In PA **717-494-1030**
Customer Service 717-494-1670

or send order to
Lyco Computer
P.O. Box 5088
Jersey Shore, PA
17740

RISK FREE POLICY

In-stock items shipped within 24 hours of order. No deposit on C.O.D. orders. Free shipping on prepaid cash orders within the continental U.S. Volume discounts available. PA residents add sales tax. APO, FPO, and international orders add $5.00 plus 3% for priority mail service. Advertised prices show 4% discount for cash, add 4% for MasterCard and Visa. Personal checks require 4 weeks' clearance before shipping. Ask about UPS Blue and Red label shipping. All merchandise carried under manufacturer's warranty. Free catalog with order. All items subject to change without notice.



The GEOS deskTop, *displaying a variety of file icons on the system's* Notepad. *The menu bar is at the top of the screen.*

However, the real story of the 64C is not the new look, but the software and hardware additions: *GEOS*, the new user interface and operating system software; the tie-in with the QuantumLink online service; and the new peripherals that will support the 64, including the Commodore 1581 3½-inch disk drive (around $225), the standard 1541 disk drive in a new 128-colored case, and—later on—128K and 512K memory expanders for the 64 (already available for 128). Happily, all of the new software and hardware can be used by current 64 owners as well.

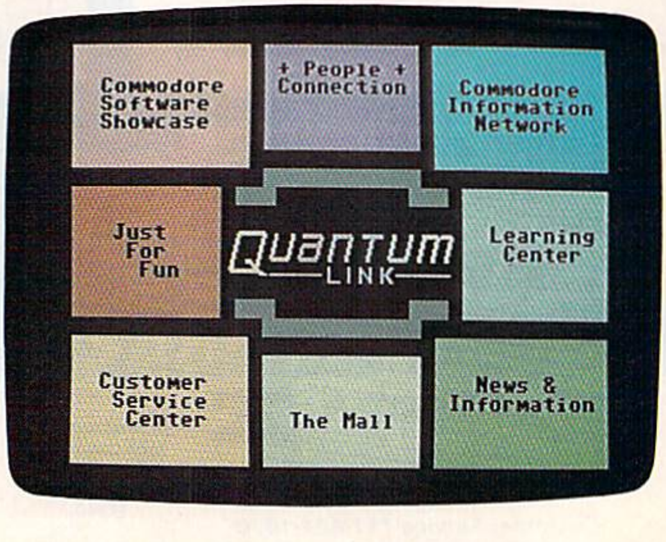
Purchasers of the Commodore 64C will pay around $160 to $180 for the computer itself. The machine will come with a disk containing the *GEOS* user interface, operating system, and applications on one side and the QuantumLink Commodore-specific telecommunications program on the other. Present 64 and 128 owners can buy the *GEOS*/QuantumLink disk from Berkeley Softworks or retail dealers for $59.95. QuantumLink, a Commodore-specific telecommunications network, charges a flat $9.95 monthly fee rather than the more expensive per-minute online connect fees used by other services. The 64C will also be bundled with an educational program on disk, *Odell Lake*, an environmental simulation of a lake that teaches children from five to eight years of age how such a habitat functions among its plant and animal inhabitants.

For those unfamiliar with *GEOS*, the system looks and feels very much like the user interface on the Macintosh, Atari ST, and Commodore Amiga computers. Included are icons representing different files and functions, pull-down menus, screen windows, a variety of type fonts, and bitmapped graphics. The *GEOS* operating system speeds up the 1541 disk drive in all its operations, generally from five to seven times normal speed. And *GEOS* allows much easier movement between applications.

GEOS is composed of four main programs, *geoWrite*, a word processor; *geoPaint*, a paint program; *GEOS*, the operating system; and *GEOS deskTop*, the user interface from which you control all of the other features. In addition to the four main programs, *GEOS* contains a variety of smaller accessory programs, such as the *Preference Manager GEOS* control panel, a calculator, an alarm clock, a variety of printer drivers, a half-dozen type fonts for printing, and *Text Album* and *Photo Album*—accessories that let you paste text from *geoWrite* into your *geoPaint* artwork—and vice versa. The accessories are available from the *GEOS deskTop* as well as from within application programs, such as a word processor. Movement of the screen cursor and selection of menu items is carried out by use of the joystick or the new Commodore 64 two-button mouse.

geoWrite is very much like the what-you-see-is-what-you-get *MacWrite* word processor on Apple's Macintosh computer. As with all of *GEOS'* functions, a menu system is used. Text can be entered, edited, moved, copied, and cut. A variety of fonts are also available, as are formats such as italics, boldface, underlining, and outlining. In standard text mode, *GEOS* displays 80 columns rather than the 64's normal 40. And, *geoWrite's* high-resolution text display allows the simultaneous use of multiple fonts, type sizes, and type styles.

Similarly, *geoPaint* resembles the Macintosh's MacPaint software, with its menu system and variety of painting tools. The original geoPaint, version 1.0, was two-color (black-and-white), but version 1.2 supports the 64's full complement

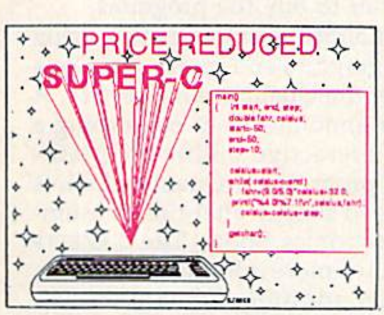


The QuantumLink opening screen offers a menu system of choices for Commodore computer users.

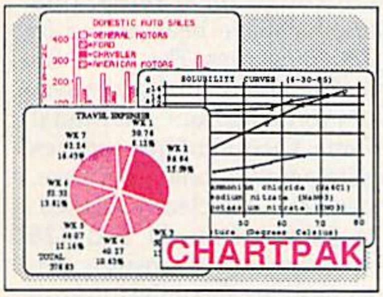
'128™ and C-64™ PROVEN PERFORMANCE

BASIC COMPILER
Make your BASIC programs run LIGHTNING SPEED!

The *complete* compiler and development package. Speed up your programs 5x to 35x. Many options: flexible memory management; choice of compiling to machine code, compact p-code or both. '128 version: 40 or 80 column monitor output and FAST-mode operation. '128 Compiler's extensive 80-page programmer's guide covers compiler directives and options, two levels of optimization, memory usage, I/O handling, 80 column hi-res graphics, faster, higher precision math functions, speed and space saving tips, more. A great package that no software library should be without. **128 Compiler $59.95**
64 Compiler $39.95



For school or software development. Learn C on your Commodore with our in-depth tutorial. Compile C programs into *fast* machine language. C-128 version has added features: Unix™-like operating system; 60K RAM disk for fast editing and compiling Linker combines up to 10 modules; Combine M/L and C using CALL; 51K available for object code; Fast loading (8 sec. 1571, 18 sec. 1541); Two standard I/O librarys plus two additional libraries—math functions (sin, cos, sqrt, etc.) & 20+ graphic commands (line, fill, dot, etc.).
C-128 $59.95
C-64 $59.95

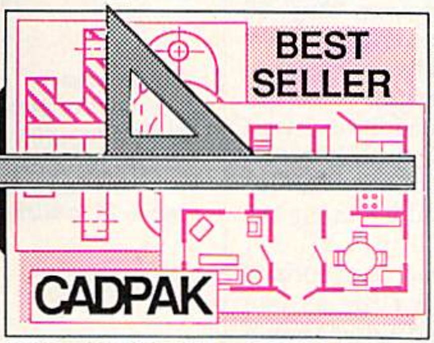


Easily create professional high quality charts and graphs without programming. You can immediately change the scaling, labeling, axis, bar filling, etc. to suit your needs. Accepts data from CalcResult and MultiPlan. C-128 version has 3X the resolution of the '64 version. Outputs to most printers.
C-128 $39.95
C-64 $39.95

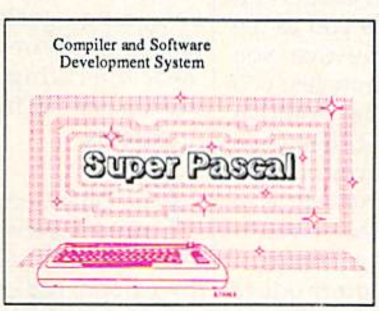
PowerPlan

One of the most powerful spreadsheets with integrated graphics. Includes menu or keyword selections, online help screens, field protection, windowing, trig functions and more. PowerGraph, the graphics package, is included to create integrated graphs and charts. **C-64 $39.95**

Technical Analysis System for the C-64	$59.95
Ada Compiler for the C-64	$39.95
VideoBasic Language for the C-64	$39.95



Remarkably easy-to-use interactive drawing package for accurate graphic designs. New dimensioning features to create exact scaled output to all major dot-matrix printers. Enhanced version allows you to input via keyboard or high quality lightpen. Two graphic screens for COPYing from one to the other. DRAW, LINE, BOX, CIRCLE, ARC, ELLIPSE available. FILL objects with preselected PATTERNS; add TEXT; SAVE and RECALL designs to/from disk. Define your own library of symbols/objects with the easy-to-use OBJECT MANAGEMENT SYSTEM–store up to 104 separate objects.
C-128 $59.95
C-64 $39.95


Compiler and Software Development System
Super Pascal

Not just a compiler, but a complete system for developing applications in Pascal with graphics and sound features. Extensive editor with search, replace, auto, renumber, etc. Standard J & W compiler that generates fast machine code. If you want to learn Pascal or to develop software using the best tools available–**SUPER Pascal** is your first choice.
C-128 $59.95
C-64 $59.95

OTHER TITLES AVAILABLE:

COBOL Compiler

Now you can learn COBOL, the most widely used commercial programing language, and learn COBOL on your 64. COBOL is easy to learn because its easy to read. COBOL Compiler package comes complete with Editor, Compiler, Interpreter and Symbolic Debugger. BEST SELLER **C-64 $39.95**

Personal Portfolio Manager

Complete portfolio management system for the individual or professional investor. Easily manage your portfolios, obtain up-to-the-minute quotes and news, and perform selected analysis. Enter quotes manually or automatically through Warner Computer Systems. **C-64 $39.95**

Xper

XPER is the first "*expert system*" for the C-128 and C-64. While ordinary data base systems are good for reproducing facts, XPER can derive knowledge from a mountain of facts and help you make expert decisions. Large capacity. Complete with editing and reporting. **C-64 $59.95**

C-128 and C-64 are trademarks of Commodore Business Machines Inc.
Unix is a trademark of Bell Laboratories

Abacus Software

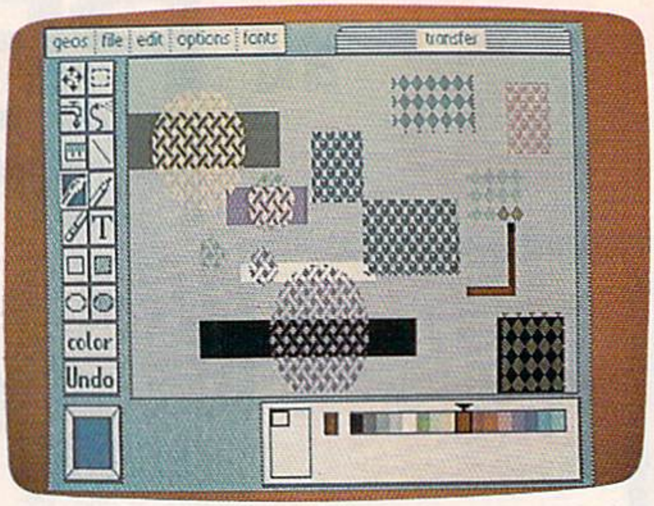
P.O. Box 7219 Dept. G8 Grand Rapids, MI 49510 - Telex 709-101 - Phone (616) 241-5510

Call **now** for the name of your nearest dealer. Or to order directly by credit card, MC, AMEX of VISA call **(616) 241-5510**. Other software and books are available–Call and ask for your **free** catalog. Add $4.00 for shipping per order. Foreign orders add $12.00 per item. Dealer inquires welcome–1400+ nationwide.

of 16 colors. (For a detailed overview of GEOS, see the June GAZETTE, "GEOS: The Quiet Revolution.")

Berkeley Softworks began marketing *GEOS* by mail order prior to Commodore's announcement that it would bundle the software with the 64C computer. Any 64 owner who purchased the first version will automatically get the latest upgrades of the program free, including a disk with additional type fonts that work with *geoWrite*. A considerable number of conveniences have been added in the latest version (Version 1.2). For example, there's now a command to easily UPDATE a file as you work. And *GEOS* also automatically saves information to disk anytime you move up or down the screen or close your document. A RECOVER menu command returns you to the last version of your file that you saved. And RENAME now lets you rename a file with ease. Another menu selection, CLEAR, has been added to the Copy Box commands. Users can now make whatever is in the Copy Box disappear—an efficient way to erase a large area.

Owners of the Commodore 128 and 1571 disk drive can boot *GEOS* and use all of the functions in 64 mode. A 128-specific *GEOS* system is planned for early fall, possibly in September. Later this summer, Berkeley Softworks will have a complete programmer's reference manual available—all of the technical documentation for software developers who want to create programs within the new operating system. In fact, that's one of the long-range goals for Berkeley and for Commodore—to create a totally new operating environment for hundreds of future commercial programs.



geoPaint now supports color graphics. Note the color selection bar along the bottom right, displaying 16 available colors.

The QuantumLink telecommunications software that comes on the back of the *GEOS* disk is for use by 64 and 128 owners only. QuantumLink, which began operations with marketing support from Commodore in late 1985, presents its users with color graphics, a menu selection system of options, downloadable software, and features similar to other online services. In addition, QuantumLink offers 64 and 128 owners the chance to preview new commercial software packages online before deciding whether to buy the programs.

Interactive online games, using color graphics and sound, are also a part of the QuantumLink service. A major announcement concerning a new interactive online entertainment program on QuantumLink is expected shortly after the Consumer Electronics Show. The GAZETTE will have more information on that, and on additional QuantumLink features, in the September issue.

As mentioned earlier, QuantumLink requires a flat $9.95 fee for access through local telephone numbers that have been set up in more than 500 cities. This provides unlimited access to most of the system's services without additional fees. Some QuantumLink services do require an additional surcharge, but those areas are clearly labeled.

For Commodore 64 and 128 owners, the new 64C answers important questions about the future of Commodore's commitment to the 64 market. Even with the company's obvious long-range plans for the Amiga and the 128, Commodore is unable to ignore the enduring popularity of the venerable 64.

The Commodore 64C sports a new 128-style look, is completely compatible with earlier 64s, and offers a new RAM-based operating system and other options.

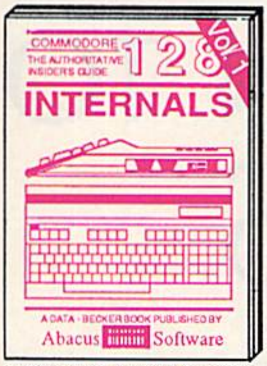
For further information, contact:

Commodore Business Machines
1200 Wilson Dr.
West Chester, PA 19380

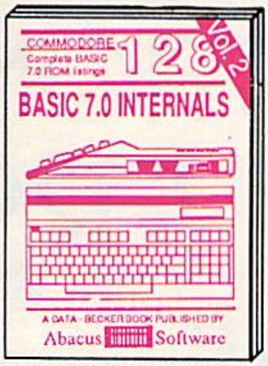
Berkeley Softworks
2150 Shattuck Ave.
Berkeley, CA 94704

QuantumLink
Quantum Computer Services, Inc.
8620 Westwood Center Dr.
Vienna, VA 22180

C-128™ and C-64™ AUTHORITATIVE BOOKS


COMMODORE 128
THE AUTHORITATIVE INSIDER'S GUIDE
Vol. 1
INTERNALS
A DATA - BECKER BOOK PUBLISHED BY
Abacus Software

Detailed guide presents the 128's operating system, explains graphic chips, Memory Management Unit, 80 column graphics and commented ROM listings. **500pp $19.95**


COMMODORE 128
Complete BASIC 7.0 ROM listings
Vol. 2
BASIC 7.0 INTERNALS
A DATA - BECKER BOOK PUBLISHED BY
Abacus Software

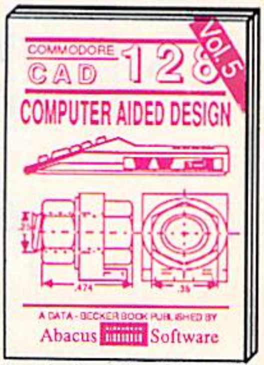
Get all the inside information on BASIC 7.0. This exhaustive handbook is complete with commented BASIC 7.0 ROM listings. Coming Summer '86. $19.95

COMMODORE 128
Practical & easy-to-use techniques for C-128
Vol. 3
TRICKS & TIPS
BEST SELLER
A DATA - BECKER BOOK PUBLISHED BY
Abacus Software

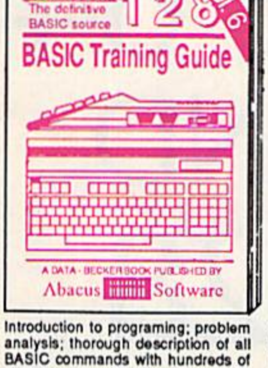
Filled with info for everyone. Covers 80 column hi-res graphics, windowing, memory layout, Kernal routines, sprites, software protection, autostarting. **300pp $19.95**

COMMODORE 128
The descriptive guide of the 1571
Vol. 4
1571 INTERNALS
A DATA - BECKER BOOK PUBLISHED BY
Abacus Software

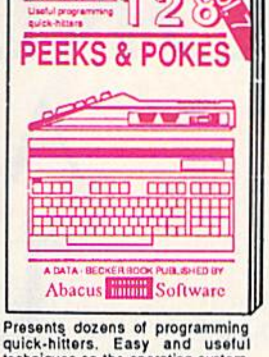
Insiders' guide for novice & advanced users. Covers sequential & relative files, & direct access commands. Describes DOS routines. Commented listings. $19.95


COMMODORE 128
CAD
Vol. 5
COMPUTER AIDED DESIGN
.474
.35
A DATA - BECKER BOOK PUBLISHED BY
Abacus Software

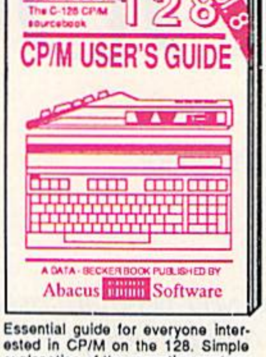
Learn fundamentals of CAD while developing your own system. Design objects on your screen to dump to a printer. Includes listings for '64 with Simon's Basic. **300pp $19.95**


COMMODORE 128
The definitive BASIC source
Vol. 6
BASIC Training Guide
A DATA - BECKER BOOK PUBLISHED BY
Abacus Software

Introduction to programing; problem analysis; thorough description of all BASIC commands with hundreds of examples; monitor commands; utilities; much more. $16.95


COMMODORE 128
Useful programming quick-hitters
Vol. 7
PEEKS & POKES
A DATA - BECKER BOOK PUBLISHED BY
Abacus Software

Presents dozens of programming quick-hitters. Easy and useful techniques on the operating system, stacks, zero-page, pointers, the BASIC interpreter and more. $16.95


COMMODORE 128
The C-128 CP/M sourcebook
Vol. 8
CP/M USER'S GUIDE
A DATA - BECKER BOOK PUBLISHED BY
Abacus Software

Essential guide for everyone interested in CP/M on the 128. Simple explanation of the operating system, memory usage, CP/M utility programs, submit files & more. $19.95

THE GRAPHICS BOOK FOR THE COMMODORE
TRICKS & TIPS FOR THE COMMODORE
ADVENTURE GAMEWRITERS HANDBOOK FOR COMMODORE 64
IDEAS FOR USE ON YOUR COMMODORE
THE ANATOMY OF THE COMMODORE
PEEKS & POKES FOR THE COMMODORE
THE ANATOMY OF THE 1541
DISK DRIVE

ANATOMY OF C-64 Insider's guide to the '64 internals. Graphics, sound, I/O, kernal, memory maps, more. Complete commented ROM listings. **300pp $19.95**

ANATOMY OF 1541 DRIVE Best handbook on floppy explains all. Many examples and utilities. Fully commented 1541 ROM listings. **500pp $19.95**

REVISED & EXPANDED

MACHINE LANGUAGE C-64 Learn 6510 code write fast programs. Many samples and listings for complete assembler, monitor, & simulator. **200pp $14.95**

GRAPHICS BOOK C-64 - best reference covers basic and advanced graphics. Sprites, animation, Hires, Multicolor, lightpen, 3D-graphics, IRQ, CAD, projections, curves, more. **350pp $19.95**

TRICKS & TIPS FOR C-64 Collection of easy-to-use techniques: advanced graphics, improved data input, enhanced BASIC, CP/M, more. **275pp $19.95**

1541 REPAIR & MAINTENANCE Handbook describes the disk drive hardware. Includes schematics and techniques to keep 1541 running. **200pp $19.95**

ADVANCED MACHINE LANGUAGE Not covered elsewhere: - video controller, interrupts, timers, clocks, I/O, real time, extended BASIC, more. **210pp $14.95**

PRINTER BOOK C-64/VIC-20 Understand Commodore, Epson-compatible printers and 1520 plotter. Packed: utilities; graphics dump; 3D-plot; commented MPS801 ROM listings, more. **330pp $19.95**

SCIENCE/ENGINEERING ON C-64 In depth intro to computers in science. Topics: chemistry, physics, biology, astronomy, electronics, others. **350pp $19.95**

CASSETTE BOOK C-64/VIC-20 Comprehensive guide; many sample programs. High speed operating system fast file loading and saving. **225pp $14.95**

IDEAS FOR USE ON C-64 Themes: auto expenses, calculator, recipe file, stock lists, diet planner, window advertising, others. Includes listings. **200pp $12.95**

COMPILER BOOK C-64/C-128 All you need to know about compilers: how they work; designing and writing your own; generating machine code. With working example compiler. **300pp $19.95**

Adventure Gamewriter's Handbook Step-by-step guide to designing and writing your own adventure games. With automated adventure game generator. **200pp $14.95**

PEEKS & POKES FOR THE C-64 Includes in-depth explanations of PEEK, POKE, USR, and other BASIC commands. Learn the "inside" tricks to get the most out of your '64. **200pp $14.95**

Optional Diskettes for books For your convenience, the programs contained in each of our books are available on diskette to save you time entering them from your keyboard. Specify name of book when ordering. **$14.95 each**

C-128 and C-64 are trademarks of Commodore Business Machines Inc.

Abacus Software

P.O. Box 7219 Dept. G8 Grand Rapids, MI 49510 - Telex 709-101 - Phone (616) 241-5510

Optional diskettes available for all book titles - $14.95 each. Other books & software also available. Call for the name of your nearest dealer. Or order directly from ABACUS using your MC, Visa or Amex card. Add $4.00 per order for shipping. Foreign orders add $10.00 per book. Call now or write for your **free** catalog. Dealer inquires welcome--over 1400 dealers nationwide.

AN INTRODUCTION TO ASSEMBLERS FOR THE COMMODORE 64 AND 128

Todd Heimarck, Assistant Editor

If you plan to get into machine language, you need an assembler. Here's an overview of features to consider before purchasing one—and an up-to-date list of commercially available assemblers.

A machine language assembler turns *source code* written by a programmer into *object code,* the program which can be executed by the computer. (Source code is sometimes referred to as assembly language because it's a language for communicating with assemblers.)

Many assemblers have at least two parts: the assembler itself and an editor program. A standard editor allows you to enter source code, insert lines, delete lines, print out the program, and save a file to disk. It may be a separate program, or it may be built into the assembler.

An editor program is similar to a word processor and, in some cases, you can substitute your favorite word processor if its files—usually sequential ASCII—are compatible with the files used by the assembler. The advantage of this is that you don't have to learn a new set of commands for using the assembler's text editor.

There's a disadvantage as well: If the editor and assembler are separate programs, writing an ML program takes several steps: 1. load the editor, 2. type in the program, 3. save it to disk, 4. load the assem-

> "If you know BASIC and want to learn machine language, this is the place to start . . . . Building on your experience as a BASIC programmer, Mansfield very gently takes you through the fundamentals of machine language."
>
> —Whole Earth Software Catalog

COMPUTE! Books'
Best-selling Machine Language Books

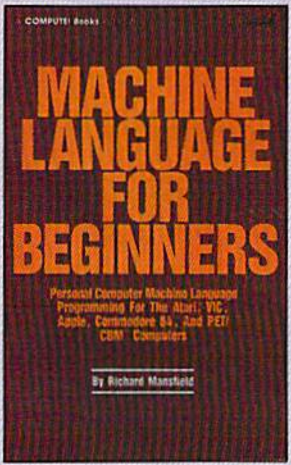
"Understandable"—**The New York Times**

"Presents the machine language novice with a very good tutorial in simple, understandable terms."
—**Antic**

"I highly recommend *Machine Language for Beginners* as your first introduction to the world of machine language." —**Commodore Power/Play**

The LADS Disk

LADS, the assembler used in *The Second Book of Machine Language*, is available on disk for only $12.95. This is a great accompaniment to the book, saving you hours of typing time by providing the complete source and object programs for all versions of the assembler, and more. And LADS disks are specific to your Apple, Atari, or Commodore computers.


COMPUTE! Books
MACHINE LANGUAGE FOR BEGINNERS
Personal Computer Machine Language Programming For The Atari, VIC, Apple, Commodore 64, And PET/CBM Computers
By Richard Mansfield

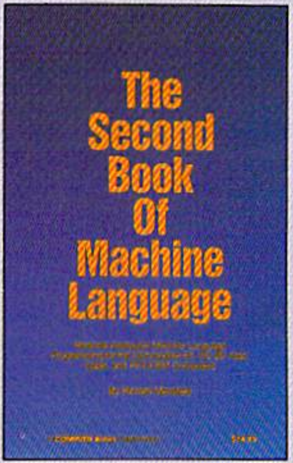
Machine Language for Beginners

Richard Mansfield

Most commercial software is written in machine language because it's far faster and more versatile than BASIC. *Machine Language for Beginners* is a step-by-step introduction. Includes a simple assembler, a disassembler, and utilities, to help beginners write programs more quickly and easily.

$14.95

ISBN 0-942386-11-6



The Second Book of Machine Language

Richard Mansfield

The follow-up to the best-selling *Machine Language for Beginners*, this book leads the programmer deeper into the most powerful and efficient programming techniques available for personal computers. Fully tutorial, with easy step-by-step explanations, the book shows how to construct significant, effective machine language programs. Included is a high-speed, professional-quality, label-based assembler. Everything that's needed for optimized programming on the Commodore 64, Apple, Atari, VIC-20, and PET/CBM computers.

$14.95

ISBN 0-942386-53-1

Machine Language for Beginners and *The Second Book of Machine Language*: everything you need to learn machine language programming on your Apple, Atari, and Commodore personal computers.

To Order: Call Toll Free 800-346-6767 (in NY 212-887-8525) or mail this coupon with your payment to COMPUTE! Books, P.O. Box 5038, F.D.R. Station, New York, NY 10150.

_____ *The Second Book of Machine Language*, **$14.95**
_____ *Machine Language for Beginners*, **$14.95**
_____ *LADS Disk* (Apple) **$12.95**
_____ *LADS Disk* (Atari) **$12.95**
_____ *LADS Disk* (Commodore), **$12.95**

☐ Payment Enclosed (check or money order)
☐ Charge ☐ MasterCard ☐ Visa ☐ American Express
Acct. No. ____________________
Signature ____________________
Name ____________________
Address ____________________
City ____________________
State __________ Zip ____________________

_____	1 Book for	$14.95
_____	2 Books for	$25.00
_____	*LADS Disk* for	$12.95
	NC residents add 4.5% sales tax	$_____
	Shipping and handling ($2.00 per book $1.00 per disk)	$_____
	Total Paid	$_____

All orders must be prepaid.
Please allow 4–6 weeks for delivery.

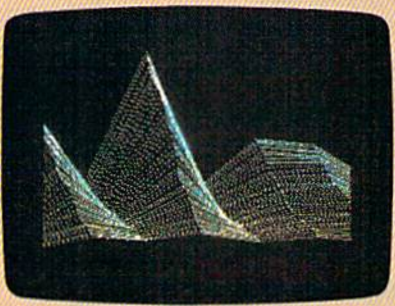
COMPUTE! Publications, Inc. abc
One of the ABC Publishing Companies

COMPUTE!'s GAZETTE DISK
Vol. 3, No. 11, Issue 29
November 1985
©1985 COMPUTE! Publications, Inc.

BUILT FOR SPEED

Now Get Inside Your Commodore with *COMPUTE!'s Gazette Disk.*

LEXITRON
RETSNOMO



Now there's a way to get all the exciting, fun-filled programs of ***COMPUTE!'s Gazette***—already on disk—with ***COMPUTE!'s Gazette Disk***.

Subscribe today, and month after month you'll get a new, fully-tested 5¼-inch floppy disk guaranteed to run on your Commodore 64, Commodore 128, or VIC-20 personal computer.

COMPUTE!'s Gazette Disk brings you all the latest, most challenging, most fascinating programs published in the corresponding issue of ***COMPUTE!'s Gazette***. So instead of spending hours typing in each program, now all you do is insert the disk...and your programs load in seconds.

RESULT: You have hours more time to enjoy all those great programs which appear in ***COMPUTE!'s Gazette***—programs like Disk Editor, Face-Off, Turbo Copy, Arcade Baseball, Sound Designer, SpeedScript, and hundreds of others.

So don't waste another moment. Subscribe today to ***COMPUTE!'s Gazette Disk*** at this money-saving price. Take a full year's subscription for just $69.95. You save 55 percent off the single issue price. Subscribe for two years and save even more! Return the enclosed card or call toll-free 1-800-247-5470 now (in Iowa call 1-800-532-1272).

Individual issues of the *Disk* are available for $12.95 (plus $2.00 shipping and handling) by calling 1-800-346-6767 (in NY 1-212-887-8525).

bler, and 5. assemble the file into object code. To make changes to the program—if there are bugs, for example—you have to go back to the editor, load the file, and edit it.

An integrated editor/assembler gives you both programs in memory at the same time. It's not necessary to go through the process of loading one, then loading the other, switching back and forth as you develop a program. Having available both the editor and assembler saves time, especially for programmers who like to write a few lines, assemble them, test the program, make a few changes, and continue from there. One disadvantage of an integrated package is that two programs take up more memory than a single program; you may have less memory available for storing the source code.

In addition to separate editors and integrated editor/assemblers, there's a third type. Some assemblers let you create source code with the built-in BASIC editor. You write and edit the source code with line numbers, as if it were a BASIC program. To look at the program, you LIST it. To save to disk, just SAVE. Relying on the BASIC editor means it's not necessary to load a separate program that takes up valuable memory. Also, if you use "BASIC Aid," "MetaBASIC," the "DOS Wedge," or other programming utilities, you can usually have them in memory at the same time as the assembler and thus have additional conveniences such as automatic line numbering and the like.

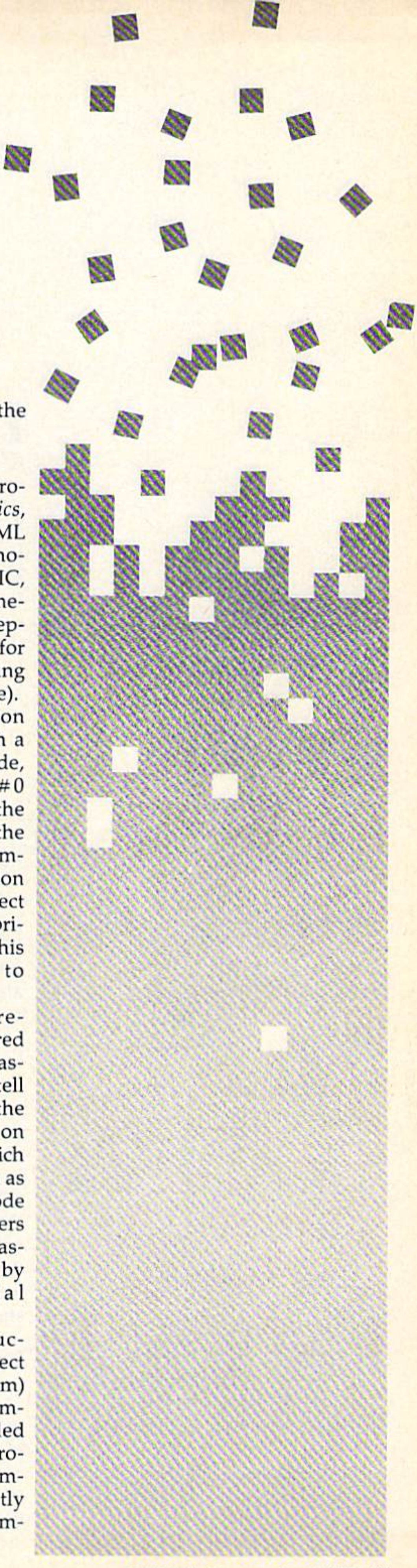
When you're writing ML programs, you'll be spending a lot of time in the editor, so it's important to find one that you feel comfortable with. Some programmers prefer an editor that's like a word processor, while others lean to assemblers that let you write with the built-in BASIC editor.

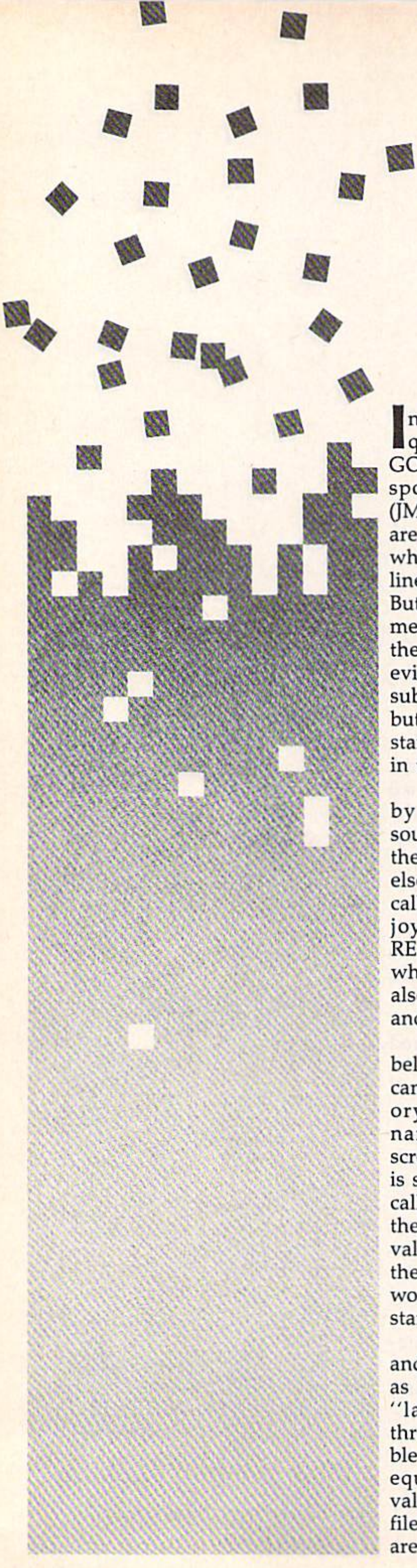
The source code for an ML program is made up of *mnemonics*, English-like abbreviations for ML instructions. On eight-bit Commodore machines, including the VIC, 64, Plus/4, 16, and 128, all mnemonics are three letters (an exception is CP/M mode on the 128; for more about this, see "Programming the Z80," elsewhere in this issue).

The three-letter abbreviation for "LoaD the Accumulator with a number" is LDA. In source code, for example, the line LDA #0 means load the number 0 into the accumulator, a register inside the main chip. When the file is assembled, the source code instruction LDA #0 is turned into the object code (numbers) 169 and 0. The primary task of an assembler is this translation from mnemonics to numbers.

A disk-based assembler requires the source code to be stored on disk. When it comes time to assemble, you save the file and tell the assembler to start creating the object code from the source code on disk. RAM-based assemblers, (which almost always have a disk option as well), read through the source code in memory. RAM-based assemblers are much faster than disk-based assemblers, which are hampered by Commodore's slow serial communications.

Depending on your instructions to the assembler, the object code (the executable ML program) can be sent to a disk file or to memory. When a program is assembled to disk, you have to load the program before testing it. If the assembler places the object code directly in memory, you can SYS to it immediately after assembly.





In BASIC, GOTO and GOSUB require a line number reference—GOTO 500, for example. The corresponding ML instructions jump (JMP) and jump to subroutine (JSR) are followed by memory addresses, which serve the same function as line numbers in a BASIC program. But in a source code file, the current memory location (also known as the program counter) is not usually evident. You may have a general subroutine for reading the joystick, but if you don't know the exact starting address, you can't JSR to it in the program.

Assemblers solve this problem by allowing labels within your source code. You place the label at the beginning of a subroutine, and elsewhere in the program you can call it by name. You might label the joystick routine something like READJOY and then JSR READJOY when you need to use it. Labels are also used extensively within loops and branches.

Equates are another sort of label. At the start of the program, you can give names to important memory locations, so you can use a name instead of a number. The screen background color on the 64 is stored in 53281, which could be called BACKGROUND. To modify the screen color, you would store a value into BACKGROUND. When the assembler got to that line, it would know that BACKGROUND stands for location 53281.

Assemblers that allow labels and equates are usually advertised as "two-pass" or "three-pass" or "label-based." In the first pass through the source file, the assembler sets up a list of labels and the equivalent memory locations or values. During the final pass, the file is assembled and the numbers are substituted for the labels.

The 128 and Plus/4 include the MONITOR command, which enables the built-in machine language monitor. Although the 64 does not come with a monitor, programs like *Micromon* and *Supermon* are widely available.

Monitors generally have a *simple assembler*, which is suitable for writing short routines, but lacking many features found in a full-fledged assembler. Simple assemblers don't support labels, for one thing, leaving it up to the programmer to calculate the addresses where subroutines start and end. Another shortcoming is that it's often difficult to insert new lines or make corrections; if an assembler/editor is like a word processor, then a monitor is like a typewriter—to add a sentence may require retyping the whole page.

The commands for disassembly and memory display make ML monitors useful for debugging, though, so some assemblers for the 64 include a monitor to complement the other programs in the package.

An assembler without frills should include at least the following features:

- A way to type, save, and load source files, whether it's a separate editor or the built-in BASIC editor.
- Assembly from disk or memory, with object files written to disk or memory.
- Labels and equates.
- Error-checking, to flag misspelled labels, duplicate labels, and mistakes of syntax.

In addition, many assemblers offer additional features like macroinstructions—usually called *macros* for short. A macro is essentially a fill-in-the-blanks mini-program. A

DIGITAL SOUND SAMPLING

NOW FOR YOUR COMMODORE 64/128

COMPLETE
SAMPLER 64
SYSTEM

ONLY
$89.95

READY TO USE
INCLUDES
MICROPHONE

Record any sound into memory and replay it instantly over several octaves, ascending or descending scale, echo, reverb, endless looping, etc. Many professional and instructional uses and fun for hobbyists.

- Sample editing capabilities
- Full 8 bit ADC and DAC conversion
- Powerful sequencer with real time input
- Live effects menu with real time echo, reverb, digital delay, etc.
- Line and Mic input, line output and feedback control

DIGITAL DRUM BONUS!

Get the COM-DRUM Digital Drum Software for only $14.95 (Reg. $29.95) when purchased with the Sampler 64.

- Turns Sampler 64 into a digital drum machine
- Real time and step sequencer
- Polyphonic sound
- Includes Digitally Recorded Drumkit Samples and pre-programmed rhythms to get you started.

SEND CHECK OR MONEY ORDER TODAY TO:
MICRO ARTS PRODUCTS
P.O. Box 2522, Dept. CG
Philadelphia, PA 19147
(215) 336-1199
Include $3.50 shipping and handling. PA residents add 6% sales tax. Visa and Master Card Accepted.

Commodore Service

3-5 Day Turn Around

(subject to parts availability)

C-64 Repair	$55.00
1541 Alignment	$35.00
1541 Repair	$75.00
Other Computers	$CALL

Parts & Return Shipping Included.
Parts & Power Supplies Also Available

To save C.O.D. charges — send Unit & Power Supply with check or M.O.

Second Source Engineering
9901 Horn Rd., Ste. B
Sacramento, CA 95827
(916) 364-5134

You wouldn't settle for half the screen. Don't settle for half the sound!

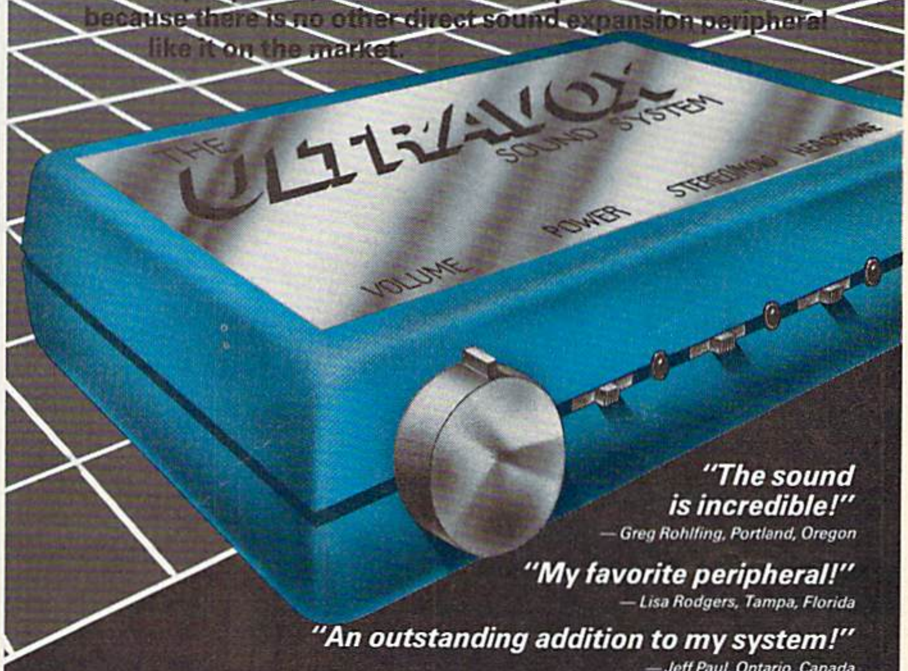
INTRODUCING

THE

ULTRAVOX

SOUND SYSTEM™

The ULTRAVOX Sound System cannot be compared to any other peripheral, such as a modem, printer or disk drive, because there is no other direct sound expansion peripheral like it on the market.



"The sound is incredible!"
— Greg Rohlfing, Portland, Oregon

"My favorite peripheral!"
— Lisa Rodgers, Tampa, Florida

"An outstanding addition to my system!"
— Jeff Paul, Ontario, Canada

THE ULTIMATE SOUND PERIPHERAL

Highly-sophisticated, with crossover frequencies designed specifically for the
COMMODORE and MACINTOSH

There's no other peripheral like it! The ULTRAVOX Sound System™ adds an exciting new dimension to all your game and music programs by generating incomparable stereo sound from your Commodore 64, 128 (64 or 128 mode), 16, or +4, or from your Macintosh computer. A built-in amp powers your speakers directly, or plug the low level outputs right into your home stereo. And with the headphone jack you can even enjoy your full-stereo sound in private.

- Full stereo separation.
- 100% compatible with all software.
- Easy to use, no software required.
- Sets up in seconds, no soldering.
- Low level outputs compatible with your stereo.
- Direct speaker outputs.
- Headphone jack included.
- Full volume control.
- 100% external hardware.
- Power supply and complete operations manual included.

COMPLETE READY-TO-GO SYSTEM ONLY **$69.95** plus $4.00 shipping/insurance (For COD orders add an additional $4.00.)
VISA, Mastercard, C.O.D.

CALL NOW (503) 254-7855

OR SEND CHECK OR MONEY ORDER TO
PRECISION PERIPHERALS AND SOFTWARE
P.O. Box 20395 Portland, Oregon 97220

All orders shipped within 24 hours. Dealer inquiries welcome.

macro that opens a sequential file for reading, for example, might call several ROM routines and leave a blank for the filename. Within your source code, you would provide the name of the OPEN macro and tell it the name of the file to be opened for reading. When the assembler assembled that line, it would find the macro in the library and insert as many instructions as necessary in the object code, plus it would fill in the name of the sequential file you wanted to open for reading. Macros, however, are often rather cumbersome to use; the complexities of passing parameters to them can make them more trouble than they're worth.

Most assemblers allow you to insert comments in the source file. These notes to yourself are like REM statements in BASIC. Some assemblers offer conditional assembly, which is helpful if you're writing for several different systems, a 64 and a 128, for example. Like macros, however, conditional assembly is an additional level of complexity (and thus an additional potential source of bugs). Writing dual-purpose source code is, many programmers think, of dubious value.

Some also include utility programs. An *unassembler,* for example, reads an object file and turns it into source code which can be loaded, edited, and re-assembled. You may also find a disk disassembler, which reads a machine language file directly from disk and lists it out as mnemonics. Occasionally, an assembler package will include the source code for the assembler itself. This is valuable because you can study the program (if you're just learning ML) or change the program, adding new features (if you're beyond the beginner's stage).

One final note: In many cases, source files are not compatible between different assemblers. If you plan to trade source code with a friend, it would be a good idea to use the same assembler. This is also true if you're studying ML in a class sponsored by a college or a user group.

Following is a list of commercial assemblers for the Commodore 64 and 128. For more information, contact the manufacturer.

Abacus Software
P.O. Box 7211
Grand Rapids, MI 49510
(616) 241-5510
Assembler Monitor 64 *(64)*
$39.95

Aquarian Software
P.O. Box 22184
Portland, OR 97222
(503) 654-2641
Total Software Development System
(64 and 128 versions on same disk)
$49.95
Instant Editor Assembler *(64)*
$17.95

Commodore Business Machines
1200 Wilson Dr.
West Chester, PA 19380
(215) 431-9100
Commodore 64 Macro Assembler Development System *(64)*
$49.95

COMPUTE! Publications
P.O Box 5038
F.D.R. Station
New York, NY 10150
(800) 346-6767
(212) 887-8525 (in NY)
LADS *(64/128)*
$12.95 to $16.95, depending on version (plus shipping)

Eastern House Software
3239 Linda Dr.
Winston Salem, NC 27106
(919) 748-8446
MAE Macro Assembler/Text Editor *(64)*
$19.95 (plus shipping)

FSI Software
P.O. Box 635
Faribault, MN 55021
(507) 332-8122
The Machine Shop *(64)*
$39.95

Hughes Associates
45341 Harmony Ln.
Belleville, MI 48111
(313) 699-1931
Freedom Assembler
$39.95 (64)
$49.95 (128)

Micol Systems
9 Lynch Rd.
Toronto, Ontario
Canada M2J 2V6
(416) 495-6864
M-2000 Machine Language Development System *(64)*
$49.95

Nu-Age Software
2311-28th St. N.
St. Petersburg, FL 33713
(813) 323-8389
Rebel Assembler Editor *(64/128)*
$29.95

Pro-Line Software, Ltd.
755 The Queensway East
Unit 8
Mississauga, Ontario
Canada L4Y 4C5
(416) 273-6350
Buddy 128 Assembler *(128)*
$69.95
PAL *(64)*
$49.95

Roger Wagner Publishing
P.O. Box 582
Santee, CA 92071
(619) 562-3221
Merlin 64 Macro Assembler *(64)*
$49.95

Robin's Software
10349 Zinran Cir.
Bloomington, MN 55438
(612) 944-8654
Instant Editor Assembler *(64)*
$5.00 plus $2.00 shipping and handling

PROGRAMMING THE Z80

Morris Simon

If you've already explored BASIC and 6502 machine language, the Commodore 128 offers a brand new and fascinating world of programming—the Z80 chip.

Are you taking full advantage of the powerful Z80 processor in your Commodore 128? I don't mean just using CP/M mode to run the thousands of free programs in public domain libraries, although that's a good start. I mean writing your own applications in Z80 assembly language.

Why? For the same reasons that many professional programmers prefer machine language (or assembly language) over high level languages like BASIC: speed, efficiency, maximum control, and just plain fun.

With a little reading and a little money, you can convert your 128 into an excellent Z80 CP/M development system. All you need to start is an assembler to assemble your source code into machine language; a loader to put your program where it'll be running in your RAM; and a debugger—since machine language programs don't always run the first time. Note that I didn't mention an editor: Most word processors will do just fine. Except for the Commodore 128, the rest of the system can cost less than $100.

You have to start learning one of two kinds of assembly language: either Intel's 8080 or Zilog's Z80 instruction set. Which one? By the time you finish this article, you'll be able to make this decision for yourself.

The Transition From 6502 Machine Language

If you've ever written a machine language (ML) program for the 64 or 128, learning Z80 machine language shouldn't be very difficult. The same ML operations found in the 6502 family of chips are available in the Z80 (plus a few more), but the Z80 uses different mnemonics. If you know what the 6502's LDA #5 means, you'll probably recognize the Z80 instruction LD A,5. The two instructions are spelled a little differently, but they do the same thing; they put the number 5 into the accumulator.

There are a few differences of which you should be aware before starting, especially if you're experienced in 6502 ML. First, the Z80 has more registers than the 6502's A, X, and Y. The Intel instructions support seven registers: B, C, D, E, H, L, and A. These are sometimes paired up for use as pointers to memory: BC, DE, and HL (the memory location pointed to by HL is called the M register, even though it's in RAM and isn't a true register). The Zilog commands include other registers, IX and IY for example. All of these additional registers serve a purpose—Indirect-Y addressing, which is widely used in 6502 programs, is not directly supported on the Z80. Instead of putting an address in a zero-page address and loading the accumulator through the pointer there, as you would in a 6502 program, you put the address into a register pair (HL, for example). The register pair serves the same purpose on the Z80 as zero-page indirect addressing does on the 6502.

There's a minor difference in hexadecimal notation, as well. When writing Z80 ML, it's more common to add the letter H after a hex number instead of putting a dollar sign in front of it. You'd substitute 400H for $0400, for example.

In Commodore 6502 ML, the Kernal routines are important; they provide common entry points, regardless of which computer you own, for essential routines that open files, get a character, print to the screen, close files, and so on. CP/M uses the same idea in its Basic Disk Operating System (BDOS) and Basic Input/Output System (BIOS) routines. The BIOS call for getting a character from the keyboard works the same on a 128, Kaypro, Osborne, or other CP/M computer. The machines are different on the hardware level, but from a software standpoint, the operating system looks the same. If you plan to do Z80 program, it pays to learn how the BDOS and BIOS routines work.

Intel Mnemonics

The Intel instruction set was designed for the Z80's precursor, the 8080. In the early days of microcomputers, most programmers wrote in 8080 assembly language. Digital Research's CP/M and most of the earlier CP/M software is written in 8080 code.

Intel (8080) mnemonics can be confusing when you're first learning them. For example, MOV means Load, as in:

```
MOV A,C        ;LOAD REGISTER A WITH BYTE IN REGISTER C
```

(In machine language, anything after a semicolon is a comment to be read and will not be processed by an assembler.)

In the example above, it might appear as if the byte in register C has been shifted to register A, but actually it's only been *copied* to register A (the accumulator). Other instruction sets, including the Zilog, use LD (for Load) for this operation. Note that MOV and LD are just different ways of saying the same thing; when the program is assembled, the object code—the numbers in memory—will be the same.

Zilog Mnemonics

The Zilog instruction set reflects the greater power of the Z80 CPU, which has many more 16-bit registers and register pairs, and facilities for direct input/ouput operations. The major improvements over the 8080 instruction set include: direct loading of all 16-bit registers and pairs, instructions for two new 16-bit index registers (IX and IY), instructions to switch sets of registers, direct input and output addressing, block shift and block transfer instructions, enhanced jump instructions, and a more comprehensible system of mnemonics.

Obviously, Zilog's instruction set was designed to take advantage of all the Z80 improvements over its cousin, the pioneer 8080. In fact, if you write programs using Z80 mnemonics, you're accessing about as much power as you can from any eight-bit processor. So why would anyone go to the trouble of learning 8080 code when they could master the Z80 instruction set just as easily? Let's look into that.

The choice between Intel and Zilog instruction sets depends on the assembler you're using to convert your source code into machine language. Digital Research (the people who invented CP/M) decided to stick with the Intel 8080 instruction set for all their software, including their workhorse assemblers, which Commodore packages for the 64 (ASM) and the 128 (MAC & RMAC).

The Z80 commands are a *superset* of 8080 commands, in the same way that Commodore 128 BASIC (version 7.0) is a superset of the Commodore 64's BASIC 2.0. The Z80 can do everything the 8080 can do, plus it has many additional commands and more registers.

Even though the 128's CP/M assembler supports the Intel mnemonics, there's an easy way to use the Zilog instruction set if you want to.

Macros

The Zilog set includes a very useful single instruction, DJNZ *address*, which is used to control loops. (DJNZ is Decrement and Jump if Not Zero.) To use it, simply load register B with the number of times you want a loop to occur, follow the load instruction with your loop subroutine, and end it with DJNZ and the address of the beginning of the loop. The program automatically decreases the value in register B and repeats the loop until B equals zero.

If you want to emulate DJNZ with Intel instructions, you have to list both components of DJNZ separately, first by DEC B, which decreases the counter by one, and then by JNZ *address*, which performs the routine as long as B does not equal zero. You might then declare the combination "DEC B" + "JNZ loop address" as an external macro.

Not all Z80 instructions can be emulated by Intel mnemonics, however, even with complex Intel macros. That's why you'll find a file called Z80.LIB on the one of the CP/M source disks from Commodore (these are the disks you receive when you mail the card in the CP/M section of the System Guide; there's also a very detailed 500+ page CP/M manual included with the disks).

To use Z80.LIB, put this line at the beginning of your source file:

```
MACLIB Z80
```

This tells the assembler you want to include the macro library file called Z80. With this line at the beginning of your program, you can use any or all of the Z80 command set. In a nutshell, it provides a lookup table that matches the Z80 mnemonics with the appropriate opcodes. It doesn't just emulate DJNZ by splitting it into DEC and JNZ, for example, it actually assembles the DJNZ instruction into the corresponding 8080-style ML instruction.

CP/M And Assembly Language

CP/M is an operating system rather than a language. The relationship between CP/M and machine language is very simple. From your program, you make *calls*—or *jumps*—to constant locations in CP/M memory any time you need the operating system to do something. CP/M has further instructions stored at those locations and will return control to your program when the job (whatever it is) is done.

For example, location 0000H contains a jump instruction to the warm boot routine in CP/M's BIOS. Therefore, anytime you wish to exit a program you could include JP 0000H (or JP 0 since decimal 0 = 0H) and the program would exit to a warm boot at that point. This is the way to finish up a program and send the user back the the CP/M A> prompt.

Most CP/M calls are made to location 0005H, where another jump instruction passes control of the program to CP/M's BDOS. Before you CALL BDOS, your program needs to give CP/M a little more information, particularly the number of the *service call* you wish to make. You put this number in register C. For example, CP/M service call number 9 is a print string function which prints to the screen an ASCII string ending in a dollar sign ($). BDOS must see the number 9 in register C *and* the string's starting address in register pair DE. At another place in your program, you'll define the string to be printed with a DB (Data Byte) instruction (and end it with a $). For example:

```
BDOS  EQU 0005H     ;THIS EQUATE WILL OCCUR EARLY IN PROGRAM
      . . .         ;OTHER CODE
      LD C,9        ;CP/M FUNCTION #9 NOW IN REG C
      LD DE,MSG     ;POINT REGS DE TO ADDRESS OF MESSAGE
      CALL BDOS     ;"BDOS" WAS DEFINED EARLIER AS "0005H"
      . . .         ;OTHER CODE
MSG     DB "This is the message to be printed.$"
```

Notice how the entries BDOS and MSG are defined in the leftmost label column. A good assembly program will clearly separate labels, instructions, operands, and comments:

```
LABEL     INSTR     OPERAND     ;COMMENT
```

It's common practice among Z80 programmers to place comments on nearly every line of source code.

In the 128 version of CP/M (CP/M 3.0, also called CP/M-Plus), there are more than 60 specialized CP/M service calls you can use in your assembly language programs. To get the most out of your machine, you should begin practicing each of the service calls in sample programs until you understand what it does.

Z80 Programming Techniques

In the examples which follow, I've used true Zilog mnemonics simply because they take less space and are easier to understand.

Loading And Storing Registers

The Z80 allows you to load practically any register from memory, from another register or by immediate loading of a value. The basic form of a typical load instruction is

LD ***destination, source***

The destination may be either a register or a memory location, and source may be a register, memory location, or a value. For example,

```
LD A,C          ;LOAD ACCUMULATOR FROM C
```

Values can be loaded directly into registers:

```
LD C,6          ;PUT VALUE 6 DECIMAL IN REGISTER C
```

or indirectly from addresses in RAM:

```
LD A,(5973H)        ;LOAD A WITH BYTE FROM ADDRESS 5973 HEX
```

or indirectly from addresses in registers:

```
LD A,(BC)       ;LOAD A WITH BYTE FROM ADDRESS IN BC
```

Note that a value in parentheses is an address, while one without parentheses is a numeral. Remember that if you want a hex number (or address), you must add the letter H. Z80 assemblers default to decimal numbers.

Storage of data is done by the reverse procedure:

LD (*address*), *register*

The stack pointer (SP) is a 16-bit value in the Z80, which means you can point it to any location in memory. This is quite useful in situations where you need to clear out a section of memory. Just set the stack pointer and PUSH a series of zeros onto the stack. If you wanted to save the stack pointer first, you'd use this instruction:

```
LD (0A71H),SP       ;LOAD STACK POINTER (A 16-BIT ADDRESS)
                    ;INTO THE TWO-BYTE LOCATION STARTING AT
                    ;A71 HEX; THE LOW BYTE WILL BE STORED
                    ;FIRST, THEN HIGH BYTE AT A72 HEX
```

A common application of the Z80 loading operations is to initialize RAM locations with certain values. For example, let's store a byte of data (BYTE) at location 500H:

```
LD A,BYTE           ;PUT DATA BYTE INTO ACCUMULATOR
LD (0500H),A        ;COPY BYTE IN REGISTER A TO 500 HEX
```

The same principle can be used to initialize word-length values by sending them through the HL register pair, which functions almost as a 16-bit accumulator:

```
LD HL,WORD         ;PUT DATA WORD INTO HL PAIR
LD (0500H),HL      ;COPY L INTO 500H & H INTO 501H
```

Arithmetic And Logic

The Z80 allows greater flexibility in arithmetic and logical operations than most other eight-bit CPU's. For a simple example, let's add a constant, NUMBER, to whatever variable happens to be in a given location, (VAR), and then change the variable:

```
LD A,(VAR)           ;COPY VARIABLE INTO ACCUMULATOR
ADD A,NUMBER         ;DO THE ADDITION
LD (VAR),A           ;AND CHANGE THE VARIABLE AT LOCATION VAR
```

Further examples of such routines would take up too much space in this article, but there are good mathematical macros in most Z80 libraries for anything you want to do. The Z80's double (16-bit) registers make double-precision calculations a breeze.

Bit Manipulation

Most eight-bit computers have only one way to manipulate individual bits—by using logical instructions such as AND and OR to *mask* or set portions of bytes. The Z80 lets you use those, if you wish, but also provides three special bit manipulation instructions: SET, RES (for reset), and BIT (to test a bit). Each of these codes works the same way:

```
SET n,r      ;SET BIT n OF REGISTER r
RES n,r      ;CLEAR (RESET) BIT n OF REGISTER r
BIT n,r      ;TEST BIT n OF REGISTER r—SET THE ZERO
             ;FLAG IF n=0 OR CLEAR IT IF n=1
```

Shift Operations

For those of you who like binary operations, the Z80 allows you to perform shift and rotate functions on any register or memory location.

Branching Instructions

The Z80's amazing repertoire of relative and absolute jumps allows conditional and unconditional branching by testing single bits, individual flags, and value comparisons. You can test a value either in a register or in memory for sign, carry, zero, or parity/overflow and then branch in ways which resemble GOTO, IF, and THEN instructions in BASIC. Some common examples:

```
CP      LIMIT       ;IS ACCUMULATOR GREATER THAN LIMIT?
JR      NC,NEXT     ;NO CARRY FLAG SO GOTO NEXT
AND     A           ;SET ALL FLAGS TO TEST ACCUMULATOR
JP      P,NEXT      ;IF ACCUMULATOR IS POSITIVE GOTO NEXT
CP      KEY         ;ELSE SEE IF A=KEY
JR      Z,LAST      ;YES, A=KEY, SO GOTO LAST
NEXT
            . . .
LAST
            . . .
```

Here's something to watch out for if you're a 6502 programmer. With the 6502, you set the carry (SEC) before a subtract with carry (SBC) operation. If the carry is still set after the subtraction, it means the first number was larger than the second. The Z80 is just the opposite: You *clear* the carry before adding or subtracting. This also affects comparisons. In the example above, the CP instruction compares the Accumulator to the number called LIMIT. If there's no carry, then the Accumulator was larger than LIMIT. (On the 6502, the carry would be set if LIMIT was smaller.)

Loops

Looping with subroutines is facilitated in the Z80 by the DJNZ instruction mentioned earlier. It's very easy to combine registers B and C to use a 16-bit loop for longer executions, or to design nested loops within loops using DJNZ.

Books

8080/Z80 Assembly Language *by Alan Miller; John Wiley & Sons, 1981. (A good introduction to both instruction sets.)*

Dr. Dobb's Z80 Toolbox *by David E. Cortesi; M&T Publishing, 1985. (Uses Intel instruction set; available on disks.)*

Soul of CP/M *by Mitchell Waite and Robert Lafore; Howard Sams & Co., 1983. (A classic on the Intel instruction set.)*

Z80 Assembly Language Subroutines *by Lance A. Leventhal and Winthrop Saville; Osborne/McGraw-Hill, 1983. (My favorite on Zilog mnemonics.)*

Software

Commodore 128 development package (MAC, RMAC, SID, etc.); from Commodore Business Machines, 1200 Wilson Dr., West Chester, PA 19380.

Echelon development system utilities (Z-Tools); for either Intel or Zilog programs; from Echelon, Inc., 885 N. San Antonio Rd., Los Altos, CA 94022.

Microsoft development system (M80, L80, etc.); for either Intel or Zilog programs; from Microsoft, Inc., 10700 Northrup Way, Bellevue, WA 98004.

SYSLIB3 by Richard Conn. (In my opinion, the best collection of Z80 routines. Available in either Intel or Zilog mnemonics from Echelon or on some bulletin boards.)

Any GAZETTE readers wanting further information on Z80 assembly language programming are welcome to write to me at 118 Brookhaven, Tuscaloosa AL 35405. Send a self-addressed, stamped envelope for a quick reply.

Handling Arrays, Tables, And Indexing

The two extra index registers plus easier access to all register pairs allow you to handle both indexed and unindexed arrays neatly and quickly. One common style of array handling involves pointing HL to a memory location, and then loading byte after byte from that location into DE for further processing. If desired, register B can be used as a counter:

```
LD       HL,(START )    ;POINT HL TO START OF ARRAY
LD       B,10           ;SET B AS A COUNTER FOR TEN REPETITIONS
MORE     LD E,(HL)      ;LOW BYTE GOES INTO E
INC      HL             ;INCREMENT HL BY ONE, POINT TO NEXT BYTE
LD       D,(HL)         ;HIGH BYTE INTO DE
INC      HL             ;POINT TO NEXT ELEMENT
CALL     LOUT           ;THIS MIGHT BE A ROUTINE TO OUTPUT DE
DJNZ     MORE           ;RETURN FROM ROUTINE, DECREASE COUNTER,
                        ;AND DO IT AGAIN UNTIL B=0
```

With indexing, a register is loaded with an offset value which is then added to the base of the array each time the loop is repeated. This example loads the accumulator with every eighth element in an array until 20 entries have been checked:

```
        LD      HL,(START)    ;POINT HL TO START OF ARRAY
        LD      B,20          ;COUNTER SET FOR 20 ENTRIES
        LD      DE,8          ;OFFSET = 8 DECIMAL
MORE    ADD     HL,DE         ;OFFSET ADDED TO BASE, STORED IN HL
        LD      A,(HL)        ;GET 8TH ELEMENT INTO ACCUMULATOR
        CALL    LOUT          ;AND DO SOMETHING TO IT
        DJNZ    MORE          ;RETURN & DO IT ALL AGAIN UNTIL B=0
```

Block Move (LDIR) And Compare (CPIR)

These categories of instructions are two of the more powerful enhancements of the Z80 over the 8080. Logically, both procedures are very simple and work the same way. You put the size of a block (in bytes) in register pair BC, then point to the beginning of the block with HL. If you're moving the block, you put the destination starting address in register pair DE:

```
LD       BC,128         ;SET COUNTER FOR 128 BYTES
LD       DE,NEWADD      ;DESTINATION TO START AT NEWADD
LD       HL,OLDADD      ;SOURCE STARTS AT OLDADD
LDIR                    ;MOVE IT!
```

If all you want to do is scan a block of data for a particular byte, you can omit the destination address, since the comparison will be done in the accumulator:

```
LD       BC,128       ;SET COUNTER FOR 128 BYTES
LD       HL,START     ;STARTING ADDRESS OF BLOCK IN HL
LD       A,1AH        ;PUT CONTROL-Z IN ACCUMULATOR
CPIR                  ;COMPARE HL WITH A AND INCREMENT HL
                      ;UNTIL EITHER ^Z IS FOUND OR BC=0
```

Enhanced Input And Output Instructions

With the Z80, you can input or output data from either your registers or RAM directly to and from your computer's various ports. And you can do this by blocks. The relevant instructions are IN, OUT, INI, IND, OUTI, OUTD, OTIR, and OTDR. They're easy to use, simply by specifying the port in question:

```
IN A,(28H)    ;GET A BYTE FROM PORT 28 HEX
OUT (C),B     ;OUTPUT BYTE IN B VIA PORT NUMBER IN C
```

The block transfers (INIR, INID, OTIR, OTDR) work very much like the block move and compare instructions described in the last section, reserving register C for the port address and HL for a memory address.

Interrupt Processing

Fast interrupts on the Z80 use the RST instruction plus the destination address. For example:

```
RST 38H        ;TRANSFERS CONTROL TO ADDRESS 38 HEX
```

There will usually be a permanent jump instruction at the destination which then sends control to a special routine, such as a graphics driver. You can also store an elaborate subprogram in the alternate register set and shift to it with an RST jump.

Your Choice

Have you decided which instruction set and assembler you want to use in your 128? If you've already bought the optional Commodore development package, which includes MAC, RMAC (for Relocatable code MACRo assembler), the SID debugger, LINK loader, and LIB library manager, then you've got a choice. If you include the Z80.LIB macro file, you can use either (or both) instruction sets.

Two other fine assembler packages are Echelon's ZAS-ZLINK and Microsoft's M80-L80 systems. Both are compatible with the Intel-based ASM-MAC family, and ZAS can even assemble code for the Hitachi HD64180, a new eight-bit CPU which is upward compatible with the Z80.

Regardless of your assembler selection, you should build up a collection of good Z80 subroutines. The best Z80 library I know of is SYSLIB3, a public domain version of which may be on a CP/M bulletin board near you. Echelon distributes SYSLIB3 in a set with other libraries and manuals for Z80 development systems for under $100.

You really can't appreciate the speed and efficiency of your Z80 until you start speaking its own language. Until then, you'll just have to be content with running thousands of excellent programs written by other people. Learning Z80 assembly language will give you even greater computing power and will allow you to do exactly what you want to do with your machine. To make it easier, refer to the list of books and software on page 40.

User Group Update

When writing to a user group for information, please remember to enclose a self-addressed envelope with postage that is appropriate for the country to which you're writing.

Send typed additions, corrections, and deletions for this list to:

COMPUTE! Publications
P.O. Box 5406
Greensboro, NC 27403
Attn: Commodore User Groups

User Group Notes

The Midwest C-64 Users Group has changed its mailing address to P.O. Box 9311, Highland, IN 46322.

The C64/128 User Group of Koeln, West Germany has disbanded.

The Platte Valley Commodore Users Group has changed its name and address to Platte Computer Users Group (PVCUG), 1685 Bonanza, Gering, NE 69341.

The CIVIC64 Commodore Users Group of Oxnard and Camarillo, CA has changed its mailing address to CIVIC64, P.O. Box 2442, Oxnard, CA 93034-2442.

The Westinghouse BWI Commodore Users Group has changed its name and address to Westinghouse Commodore Users Group, P.O. Box 8756, Baltimore, MD 21240.

Antelope Valley Commodore User Group (AVCUG) has a new address: P.O. Box 4436, Lancaster, CA 93539.

The Commodore Club of Mobile is now the Amiga/Commodore Club of Mobile. The address remains: 3868-H Rue Maison, Mobile, AL 36608.

The Arizona VIC & 64 Users Group has changed its name and address. It's now the Arizona Commodore Users Group, P.O. Box 27201, Tempe, AZ 85282.

Power Surge Users Group also has a new address: c/o Orangewood Academy, 13732 Clinton Ave., Garden Grove, CA 92643.

The Colorado Commodore Computer Club's new address is 11855 Adams St., Northglenn, CO 80233.

The Naugatuck Valley Commodore User Group has a new mailing address: P.O. Box 622, Waterbury, CT 06720.

The Redwood Falls Area Computer Exchange can now be reached at 717 E. Wyoming St., Redwood Falls, MN 56283.

The Heartland Users Group's new address is P.O. Box 443, Cape Girardeau, MO 63701.

The Tri-Cities Commodore Club has a new address: 802 Kimrod Dr., Johnson City, TN 37601.

The Old Hickory Commodore Users Group can now be reached at 542 Lambuth Blvd., Jackson, TN 38301.

Billy Schultz of McKinney, Texas is interested in starting a Commodore user group. He can be reached at 2808 Colonial Ct., McKinney, TX 75069.

New Listings

ALABAMA

The Byte Bunch, 318 Perryman St., Evergreen, AL 36401

Commodore User Group, Rt. 2, Box 105, Smiths, AL 36877

ALASKA

Mat Su Commodore 64 Club Inc., Box 1208, Palmer, AK 99645

ARIZONA

Phoenix Arizona Commodore Club, P.O. Box 34905, Phoenix, AZ 85067

ARKANSAS

Commodore Information Association, P.O. Box 1755, Conway, AR 72032

CALIFORNIA

C.P.U. Commodore Users Group, 27202 Corcubion, Mission Viejo, CA 92692

Point Mugu Users Association, P.O. Box 42360, Point Mugu, CA 93042

Commodore Systems User Network, P.O. Box 261, Lompoc, CA 93438

FLORIDA

Welaka Commodore Users Group, P.O. Box 909, Welaka, FL 32093

Northwest Florida Commodore User Group, P.O. Box 15565, Pensacola, FL 32514

Fellsmere's Club Compu-Mania, 2149 Watkins Rd. S.E., Palm Bay, FL 32907

ILLINOIS

The Software Link, 763 Stewart Ave., Elgin, IL 60120

The 64 Smorgasboard, 51 Thornhill Dr., Danville, IL 61832

INDIANA

Kosciusko Commodore User's Group, 1721 S. Latta St., Warsaw, IN 46580

Richmond Area Commodore Users Group, P.O. Box 1332, Richmond, IN 47375

IOWA

Plymouth County Commodore Users Group, 300 Third Ave. SE, Lemars, IA 51031

KANSAS

Newton Area Commodore Club, Larry Wilson, 112 Brookside, Newton, KS 67114

MASSACHUSETTS

Commodore Users Group of Cape Cod, P.O. Box 1490, Cotuit, MA 02635

Massachusetts Electronic Modem Operators (MEMO), P.O. Box 3336, Fall River, MA 02722-3336

MICHIGAN

Downriver Commodore Group, P.O. Box 1277, Southgate, MI 48195

Washtenaw Commodore Users Group, 4490 Oakengates Dr., Ypsilanti, MI 48197

Central Michigan Commodore Users Group, 5600 N. Bollinger Rd., Vestaburg, MI 48891

Elk Rapids Commodore Users Club, 6697 E. Harbor Dr., Elk Rapids, MI 49629

Northern Michigan Commodore Club, P.O. Box 3066, Gaylord, MI 49735

U. P. Computer Users Group, P.O. Box 508, Ishpeming, MI 49849

MINNESOTA

Commodore User Learning Exchange, 718 N. First Ave. E., Duluth, MN 55805

MISSOURI

Forefront C-128 National Users Group, P.O. Box 21836, St. Louis, MO 63109

NEBRASKA

International Commodore Language Interest Group, 1812 North 1, Fremont, NE 68025

NEW HAMPSHIRE

Commodore Users Group, R.D. 9, Box 307, Concord, NH 03301

NEW YORK

Commodore Computer Game Pros of NY, 4263 Carpenter Ave., Bronx, NY 10466

For Your Computer Only, 35 Belleview Ave., Ossining, NY 10562

Commodore Long Island Club, 2949 Roxbury Ct., Oceanside, NY 11572

Frontier Commodore Users, RFD #1, Box 352A, Chazy, NY 12921

The Shadows Commodore 64 Users Group, 10 Boylston St., Oneonta, NY 13820

OHIO

Dayton Area Commodore Users Group, 679 Murray Hill Drive, Xenia, OH 45385

OKLAHOMA

Coweta-Commodore Users Group, Box 8204, Coweta, OK 74429

Osage/Kay Commodore User's Group (OKCUM), 300 Woodbury Rd., Ponca City, OK 74601

PENNSYLVANIA

Susquehanna Valley User Group, RD #5, Box 145, Danville, PA 17821

ABC C-64 Chips Commodore Users Group, 3159 Middletown Rd., Bethlehem, PA 18017

TENNESSEE

Cleveland Commodore User Group, 2413 Hickory Dr. NW, Cleveland, TN 37311

TEXAS

Commodore Users Club, 5309 Strickland, The Colony, TX 75056

Klein Commodore Users Group, 7627 Litchfield Ln., Spring, TX 77379

WASHINGTON

Commodore Bellingham Users Group (CBUG), P.O. Box 2756, Bellingham, WA 98227

WISCONSIN

Club 84, P.O. Box 72, Caledonia, WI 53108

Outside the U.S.

AUSTRALIA

Cairns Commodore Users Group, P.O. Box 7, Earlville, Cairns, Queensland 4870, Australia

BERMUDA

Commodore Computer Club of Bermuda, P.O. Box HM 2093, Hamilton 5, Bermuda

BRAZIL

Brasilian Club of VIC-20, Flavio Joao Piagentini, Rua Heitor de Moraes, 856-Pacaembu, Sao Paulo, Brasil 01237

CANADA

Powell River Commodore User Group (P.R.C.U.G.), 5562 Willow St., Powell River, B.C., Canada

Microcom 64, 110 St. Louis St., Rimouski, Quebec G5L 5P7

INDIA

Commodore Users Group, c/o S. Ram Gopal, 1 B, 19th 'D' Main Rd., Rajajinagar First Block, Bangalore 560 010, India

JAPAN

Zama/Atsugi Commodore Users Group, 500th. MI. Gp. Box 45, APO, San Francisco, CA 96343-0091

POLAND

Stefan Kssecki or Elizbieta Kossecka, 02-757 Warszawa, ul. Burgaska 3/24/1, Poland

Andrzej Wiechowski, ul. Lokietka 47/38, 31-279 Krakow, Poland

Walter Sulimierski, ul. Olimpijska 56, 02-636 Warsaw, Poland

SPAIN

Costa Blanca Computer Club, c/o Ed Kelly, Montebello 25, La Nucia-Alicante, Spain

SWEDEN

Swedish Esoteric Society Avec Modem, Lars B. Lundin, Parkgatan 16 3tr., S-112 30 Stockholm, Sweden

WEST INDIES

Caribbean Commodore Computer Club, Jim Lynch, P.O. Box 318, St. Johns, Antigua, West Indies

---

To Our Readers:

COMPUTE! Publications is a part of the ABC Consumer Magazines group of ABC Publishing, Inc. and recently we consolidated many of our operations and moved our Customer Service Department to the New York ABC headquarters. If you have any questions regarding back issues, disk orders, book orders, or how to place an order, call toll free **1-800-346-6767**. New York residents should call 212-887-8525.

If you want to order a subscription to COMPUTE!, COMPUTE!'s GAZETTE, COMPUTE!'s GAZETTE DISK, or the COMPUTE! DISK, call **1-800-247-5470** or in Iowa call 1-800-532-1272.

Our Editorial Offices remain in Greensboro, North Carolina. If you wish to submit an article for publication, write us at COMPUTE! Publications, Inc., P.O. Box 5406, Greensboro, NC 27403.

We thank you for your interest and continued support of COMPUTE! Publications.

COMPUTE! Publications, Inc. abc

Part of ABC Consumer Magazines, Inc.
One of the ABC Publishing Companies

Golden Oldies, Volume 1

Golden Oldies is a slice of computer history on a disk, containing four classic computer software games—the first all-text computer adventure game, *Adventure;* the self-replicating world-within-a-world, *Life;* the original arcade game, *Pong,* and the famous simulated computer psychiatrist, *Eliza.*

It's only fair to state immediately what these programs are *not.* They in no way can be compared with the computer software available today; in fact, as one experienced computer programmer and writer points out, these programs represent early, crude attempts at programming before programming was done well. They also show *all* of the limitations of computer hardware just 10 to 15 years ago. Don't expect the advanced graphics and sound features and the other bells and whistles you've come to expect on the Commodore 64 and 128.

On the other hand, *Golden Oldies* is a fascinating look at just how far computer software has come. For anyone interested in the roots of personal computing, these four programs each represent a distinctly different cornerstone of today's software. *Adventure* was the precursor to all of the computer fantasy and adventure games. *Eliza* has been hailed as a program important in the early thinking about artificial intelligence, even though its author viewed it as a joke. *Life* is, in many ways, the forerunner of today's sophisticated computer simulation and modeling programs. And *Pong* spawned the entire arcade computer game industry. Though the programs are seriously dated by today's standards, remember that each one was a pioneering effort in its time.

These programs are recreated here in a form faithful to the original. For example, this is the authentic version of *Adventure* endorsed by its creators, Will Crowther and Don Woods, who originally developed the game on a mainframe computer in the early days of "hacking," or computer programming. The version of *Pong* included on the disk is actually a recreation of the original game by Al Alcorn, who first developed *Pong* for Nolan Bushnell's then-fledgling company, Atari. There's also an alternate version included with a few more features.

The *Golden Oldies* package is enhanced by its manual, a 42-page booklet that engagingly recreates the historical context, samples of play, and related information. Excerpts from such recent books as Tracy Kidder's Pulitzer Prize-winning *The Soul of a New Machine*, Steven Levy's *Hackers*, Scott Cohen's *Zap, The Rise and Fall of Atari*, and William Poundstone's *The Recursive Universe* all help to set the stage as you use the programs.

For those unfamiliar with each of the programs, here's a brief explanation of what they're about:

Adventure is an all-text game in which you explore the mysteries of Colossal Cave, gathering treasure and avoiding the many dangers of this subterranean world. Don't expect the kind of full-sentence interaction you may have come to expect from recent text adventures. *Adventure* understands one- or two-word commands, and only the first five letters of each word. Still, the game itself is fun, if limited in scope.

Pong (from *Ping-Pong*) is the original computer table tennis game, in which you control an onscreen paddle that bounces the ball, a white blip on the screen, back and forth. You can play against the computer, or two people can play against each other.

Eliza, first developed by computer scientist Joseph Weizenbaum to mimic Rogerian psychotherapy, has been taken seriously by many people as an early example of artificial intelligence. It's really just a very clever program that appears to understand your questions and statements, leading you gently through an exploration of your feelings. Weizenbaum was reportedly quite surprised when people began calling *Eliza* an example of machine intelligence. He meant it more as a joke than a serious endeavor. It can be a lot of fun to play with, but remember that it's a game. There are other implementations of *Eliza,* some more complete than others. This version is supposed to be a faithful recreation of Weizenbaum's original.

Life is a computer simulation that was originally developed by British mathematician John Conway, and then popularized by science writer Martin Gardner in the October 1970 issue of *Scientific American*. The game of *Life* is played on a grid field, where successions of small screen symbols—called *generations* of *cells*—live out their lives according to a set of arbitrary physical laws. Depending on the rules, the individual cells live and prosper, die and make way for new cells, mutate into different forms, and so on. It's a complete world or universe in microcosm, and has fascinated many computer users since its introduction on mainframe computers (and later on microcomputers). You really have to experience *Life* to understand it, and once hooked on its complexities, you may find it fascinating.

Golden Oldies is a trip into the past for a look at where personal computing started. And despite the limitations of the programs, it's a nostalgic and entertaining journey.

—Selby Bateman

Software Country
9713 Santa Monica Blvd.
#202
Beverly Hills, CA 90210

Electronic Arts (distributors)
1820 Gateway Dr.
San Mateo, CA 94404
$29.95

RADARBASIC 50K

RADARBASIC 50K is a handy utility program offered on a plug-in cartridge for the Commodore 64. It's a product of Radarsoft, a Dutch software company that's fairly new in this country.

As the title implies, *RADARBASIC 50K* gives you 50K (51,199 bytes) of free RAM, all of which is available for BASIC programs. This is 12K more RAM than is normally available with the Commodore 64, and there's no conflict with your old BASIC programs. They may not take advantage of the additional memory, but they'll all work as usual with one minor exception: Since the 12K area added to BASIC RAM starts at 40960 and extends to 53247 ($A000 and $CFFF in hex), any BASIC program that uses this area to PEEK or POKE memory, or for a machine language routine, will not work properly. It's not necessary to unplug the cartridge if you do have a program that uses this area. Merely type in a shifted K (for Kill) and press RETURN. The computer is reset to its conventional status and you can load and run your program as usual.

Perhaps the most interesting thing about this program is the commands it adds to the standard Commodore operating system to easily access disk and tape drives. Similar in some ways to other disk wedge programs, I found the ease of use, versatility, and logic of these new commands to be better than any other disk enhancement program I've used. All the commands are entered by pressing a single shifted key and RETURN. Never has it been so easy to perform all the functions that are necessary to access your disk drive. People who use two drives will greatly appreciate the way you can switch from one to the other. The program starts with device #8 as the default device. If you have a second drive, just type #9 (or whatever device number it's set for) and it becomes the new default device, accessible by all the single key commands. Typing #8 and pressing RETURN takes you back.

Cassette users will also be interested in this program. Type #1 and then press RETURN and the cassette is now the default device with all the single key commands available (except those that only relate to a disk drive). And there's another option for the cassette user. Set the device to #2 and you can SAVE and LOAD at ten times normal speed. That's about as fast as your disk drive and it worked reliably every time I tried it. You must remember though that programs saved this way cannot be loaded without use of the cartridge.

Two other commands are available. SHIFT-R lets you renumber a BASIC program, selecting a new starting line number and increment value. SHIFT-C followed by a number between 1 and 16 immediately changes the screen and border color—much faster than the usual POKEing method.

RADARBASIC 50K is a handy utility package. It provides additional RAM for BASIC, convenient commands, and it's not necessary to unplug the cartridge to run other programs. The cartridge also works well in 64 mode on the Commodore 128. The brief instruction manual is not as clearly written as it should be, but operation is so easy to understand that no one will have any difficulties using the program.

—Howard Parnes

Radarsoft
Adam, Cobb, & King, Inc.
655 John Muir Dr. E411
San Francisco, CA 94132
$37.50

Lords of Conquest

This is a classic strategy game for the Commodore 64 in which the player's ultimate goal is territorial supremacy. It's a game of maps, invasions, and defense—and it has a large number of options. Up to four players may compete, or you can play against your computer. As in *Risk* or the Japanese game *Go*, board games similar in concept to *Lords of Conquest*, players take turns selecting territories on the map. Some of these are important because of their location, others because of their wealth in natural resources.

Action takes place in yearly cycles consisting of several phases: development, production, trading, shipment, and conquest. During each phase, each player must make important decisions: Should you move your stockpile of resources to a new territory, better protected from an attack? Or should you use your wealth to develop a weapon or establish a new city?

The first phase to be considered in each year—after the first year—is development. You can invest your wealth in developing weapons or in building a new city. Often the choice is a difficult one: Is one of your neighbors preparing for an invasion? Will you gain more in the long run by developing a new city rather than a new weapon?

Next, in a multiplayer game, you're faced with deciding whether to trade resources with other players. Of course, you may threaten, reason, bribe, or deceive your opponents in attempts to gain your own advantage. The computer doesn't intervene in this phase—all trades are made verbally between players. Once a deal has been struck, you relay the results to your 64.

Following the trade phase, you decide whether to move your stockpile of wealth or transfer some of your forces to a more strategic location.

Finally, you enter the conquest phase. This is where the real action in *Lords of Conquest* occurs. It's your chance to launch a relentless attack on a neighboring territory. If you've plotted your moves correctly, you could gain a strategic victory. A wrong move could tip your hand prematurely.

Lords of Conquest is a highly involved scenario with many levels of complexity so that each game, whether against friends or the computer, is bound to have a different outcome. You may choose to play on any of the 20 maps included, or, once familiar with the rules, you may create your own map.

This is a highly enjoyable game. The designers have made it easy to use and easy to play. You'll find yourself very quickly concentrating on your

COPY II 64/128™

BACKUP PROTECTED SOFTWARE FAST.

From the team who brought you COPY II PLUS (Apple), Copy II PC (IBM) and COPY II MAC (Macintosh) comes a revolutionary new copy program for the Commodore 64 and 128 computers.

- Copies many protected programs—automatically. (We update Copy II 64/128 regularly to handle new protections; you as a registered owner may update at any time for $15 plus $3 s/h.)
- Copies even protected disks in under 2 minutes (single drive).
- Copies even protected disks in under 1 minute (dual drive).
- Maximum of four disk swaps on a single drive.
- Includes fast loader, 12-second format.

Requires a Commodore 64 or 128 computer with one or two 1541 or 1571 drives.

Call 503/244-5782, M–F, 8–5:30 (West Coast time) with your in hand. Or send a check for $39.95 U.S. plus $3 s/h, $8 overseas.

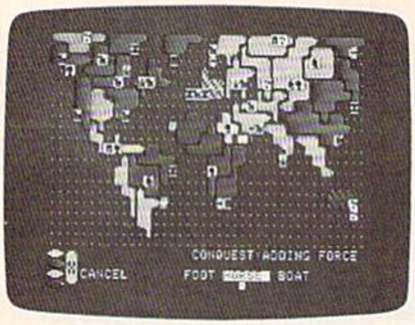
$39.95

Central Point Software, Inc.
9700 S.W. Capitol Hwy. #100
Portland, OR 97219

Central Point Software INCORPORATED

Backup utilities also available for the IBM, Apple II, Macintosh and Atari ST.

This product is provided for the purpose of enabling you to make archival copies only.



strategy and not on how to communicate with the program. Playing time is usually less than three hours, and a "save game" option is available.

Success in this game requires careful strategy and an ability to play offensively and defensively. Make the right moves, and you'll be hailed as the reigning Lord of Conquest.

—George Miller

Electronic Arts
1820 Gateway Dr.
San Mateo, CA 94404
$32.95

Garry Kitchen's GameMaker

For those of us still using programming incompetence as an excuse for not creating our own computer games, Activision's *GameMaker* comes as a rude shock. *GameMaker* is a thorough, complete package that makes it relatively easy to design arcade games that actually work. Game design is still no picnic, but spending the time needed to understand *GameMaker* will put the burden on the creative rather than the mechanical side of creating quality games. We can no longer hide behind incompetence.

GameMaker consists of five separate modules: SceneMaker, SpriteMaker, SoundMaker, MusicMaker, and the Editor. You use the first four to create the graphics and sound features of your design, then combine them into a working game by using the Editor. Once satisfied that your game is a good one, you can save it to disk and play it, give it away, or sell it. The finished game runs independent of the original program.

All you need to design a game is a joystick; you don't have to type anything. In each module, you use the joystick to move from feature to feature, name to name, even number to number. Even the program commands are selected by joystick from a Command Window; lines with more than one instruction still use only the joystick. Those without joysticks can use the function keys and the space bar instead.

SceneMaker allows you to design the backdrops against which your game moves. It is in effect a paint program, with a wide choice of colors and such commands as Draw, Circle, Line, Box, Fill, Zoom, Copy, View, Move, and Erase. Anyone familiar with paint programs will recognize that this list allows considerable flexibility in creating a picture. In fact, *GameMaker*'s individual modules are all thorough and flexible.

With SpriteMaker, you create the sprites that will move across the scene. Once again, everything is done with the joystick. You simply draw the sprite as you want it, then, if you wish, combine it with other sprites, or with other frames of the same sprite, to animate it. For example, you might use four sprites to create a horse, then give each of the four six separate moving "frames". Your horse will then run across the screen, or buck up and down. The animation is as sophisticated as you make it.

SoundMaker creates sound effects. The SoundMaker screen resembles a "sound board" found in a recording studio, with knobs and sliders and gauges. The master controls are Repeat, Equalizer, Volume, Speed, and Frame (complex sounds can consist of several linked frames). Sound controls include Wave (noise, square, sawtooth, or triangle), Attack, Decay, Sustain, Release, Frequency, Speed, Pulse, Duration, and Tie. You use the joystick to create the sound, listen to it, modify it, and save it to disk.

Since most arcade games contain music, *GameMaker* includes a MusicMaker module. The MusicMaker screen includes a keyboard, a staff, selectors for notes, channels, and instruments, and a music sheet. Those familiar with music programs on the Commodore 64 will find this module, like all the modules in *GameMaker*, quite sophisticated and versatile.

To ease you into creating your own games from scratch, *GameMaker* includes several samples for each module. There are plenty of precreated scenes, sprites, sounds, and tunes on the *GameMaker* library disk, which you can load and examine, change, or copy. These not only save time, but also help you learn how to use the features of the individual modules. By loading a sound effect into SoundMaker, for example, then twisting the knobs and moving the sliders, you can figure out quite easily what each command does. If you wish, you can create entire games by mixing the sprites, sound, music, and scenes already provided.

Once you have a scene, the sprites, the sounds, and the music ready to go, you put them all together using the Editor. The Editor provides the programming language itself, and is the hardest module for nonprogrammers to use. Once again, though, *GameMaker* helps out. The manual contains a run-through of the various commands and a tutorial to get you started. Furthermore, the library disk includes several predesigned games (*Pitfall* and *Megamania* among them) that you can load into the Editor and examine. How does Pitfall Harry grab the rope and jump over the pond? How does the score change? Simply load it into the Editor and find the appropriate line in the program.

The heart of the manual is the Advanced Game Design section. Here Garry Kitchen, *GameMaker*'s creator, explains what to keep in mind when designing a game. Here too are listed all the commands possible in the *GameMaker* modules, including explanations of the numerous commands in the Editor. To create truly excellent games, you will need to master much of this section, and doing so is not easy. But you need not master them all at once, and you can work on individual commands as you create your design.

If you get good enough, and you create an arcade game that you feel the world will want to play, Activision will welcome it as an entry in the *GameMaker* design contest. The winner receives $5000, a paid visit to Activision, and, most importantly, Activision will publish the game. If you've always felt able to design a great game, but never had the programming skill to attempt it, *GameMaker* is for you. Like any good game, writing it is not easy, but once you've done so, the rewards are endless.

—Neil Randall

Activision, Inc.
2350 Bayshore Frontage Road
Mountain View, CA 94043
$39.95

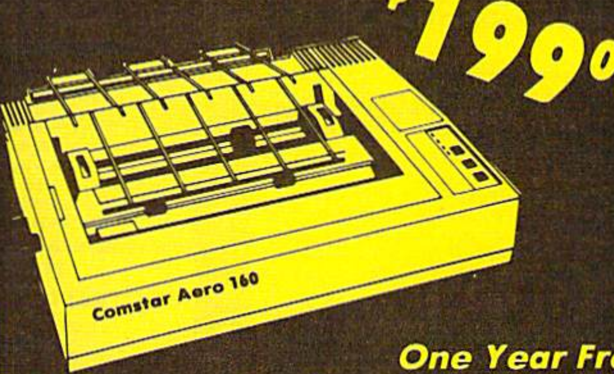
To receive additional information from advertisers in this issue, use the handy reader service cards in the back of the magazine.

Giant Printer Sale

10" Comstar Aero 160

150-170 CPS Sale $199.00 **150-170 CPS**

- Tractor Friction Printer
- Dot Matrix, Impact, Prints Single Sheets or Continuous Feed Paper, 10" Carriage
- Print buffer
- 9 x 9 Dot Matrix, Double Strike
- Near Letter Quality*, High Resolution, Dot Bit Image
- Underlining, Backspacing, Left-Right Margin
- True Low Descenders, Super and Subscript
- Prints Standard, Block Graphics
- Better than Gemini 10X
- Centronics Parallel Interface



$199.00

10" Comstar Aero 160 $199
List $499 Sale

One Year Free Replacement Warranty

PRINTER	Impact Dot Matrix
PRINT HEAD	9 Wire (User Replaceable)
PRINT SPEED — Bi-directional Logic Seeking	10" ComStar 160: 150-170 CPS
PAPER SLEW SPEED	10 LPS at 1/6" Spacing
PRINT BUFFER	2K
PRINT SIZE	10, 12, 17, 5, 6, 8.5 CPI
NUMBER OF COLUMNS	10" ComStar 160: 80, 96, 136 (40, 48, 68 Double Width)
CHARACTER MATRIX	9 x 9 Standard, with True Descenders 18 x 9 Emphasized 18 x 18 Double Strike 6 x 6 Block Graphics 60 x 72 Low Resolution, Bit Image Graphics 120 x 144 Hi Resolution, Bit Image Graphics 240 x 144 Ultra Hi Resolution, Bit Image Graphics
CHARACTER SETS	96 Standard ASCII, 64 Special, 32 Block Graphic, 96 Downloadable, 88 International Characters
CHARACTER FONTS	Normal (10 CPI) Elite (12 CPI) Condensed (17 CPI) Enlarged (5, 6, 8.5 CPI) Emphasized Double Strike (NLQ) Super and Sub Script * With "XETEC" Graphic Junior Interface
SPECIAL FEATURES	Self-Test Macro Instruction Continuous Underline 8 Bit Selectable Interface Column Scan Bit Image Graphics Vertical and Horizontal Tabs Skip Over Perforation
LINE SPACING	1/6", 1/8" Plus Programmable by n/144" or n/72"
PAPER HANDLING	10" COMSTAR 160 Roll Paper: 8.5" to 10" Wide Cut Sheet: 8" to 10" Wide Sprocket: 3" to 10" Wide Copies: 3 Carbonless Sheets
RIBBON	10" ComStar 160 Cartridge $9.95
INTERFACE	Standard Parallel (Centronics Compatible)
DIMENSIONS — In Inches	10" COMSTAR 160 15.36W X 12.6D x 5H
WEIGHT — In pounds	10" COMSTAR 160: 11 lbs.

All product data subject to change without notice.

Parallel Interfaces: Commodore 64 — $49.95 Apple II, IIe, II+ — $59.00 Atari — $49.95

Add $10.00 for shipping, handling and insurance. Illinois residents please add 6¼% tax. Add $20.00 for CANADA, PUERTO RICO, HAWAII, ALASKA, APO-FPO orders. Canadian orders must be in U.S. dollars. WE DO NOT EXPORT TO OTHER COUNTRIES, EXCEPT CANADA. Enclose Cashier Check, Money Order or Personal Check. Allow 14 days for delivery, 2 to 7 days for phone orders, 1 day express mail! Prices & Availability subject to change without notice.
VISA — MASTER CARD — C.O.D. C.O.D. on phone orders only

PROTECTO
We Love Our Customers
22292 N. Pepper Rd., Barrington, Illinois 60010
312/382-5244 to order

COMMODORE 64 COMPUTER

(Order Now)

$13995

- C128 Disks 79¢ ea.*
- Paperbock Writer 64 $39.95
- 13" Color Monitor $139.95

CALL BEFORE YOU ORDER

COMMODORE 64 SYSTEM SALE

Commodore 64

Plus $30.00 S&H

Com. 1541 Disk Drive

13" Color Monitor

$457

C128 Commodore Computer & 1571 Disk Drive

$499.00

- Voice Synthesizer $39.95
- 12" Monitor $79.95

PRICES MAY BE LOWER

COMMODORE 64 COMPUTER $139.95

You pay only $139.95 when you order the powerful 84K COMMODORE 64 COMPUTER! LESS the value of the SPECIAL SOFTWARE DISCOUNT COUPON we pack with your computer that allows you to SAVE OVER $250 off software sale prices!! With only $100 of savings applied, your net computer cost is $39.95!!

* C128 DOUBLE SIDED DISKS 79¢ EA.

Get these 5¼" Double Sided Floppy Disks specially designed for the Commodore 128 Computer (1571 Disk Drive). 100% Certified, ***Lifetime Warranty***, Automatic Lint Cleaning Liner included. 1 Box of 10 - $9.90 (99¢ ea.), 5 Boxes of 10 - $44.50 (89¢ ea.), 10 Boxes of 10 -$79.00 (79¢ ea.).

13" COLOR MONITOR $139.95

You pay only $139.95 when you order this 13" COLOR MONITOR. LESS the value of the SPECIAL SOFTWARE DISCOUNT COUPON we pack with your monitor that allows you to save over $250 off software sale prices!! With only $100 of suvings applied, your net color monitor cost is only $39.95. (16 Colors).

Premium Quality 120-140 CPS Comstar 10X Printe $148.00

SOLD OUT

The COMSTAR 10X [illegible] carriage, 120-
140 CPS, 9 [illegible] double strike
capabilit [illegible] (near letter
quality), [illegible] 120 x 144 dot
matrix), [illegible] eft and right
margin se [illegible] with super
and subsc [illegible] alic, block
graphics an [illegible] s. It gives you print
quality and [illegible] round on printers costing
twice as much!! (Centronics Parallel Interface) List $399.00 **Sale $148.00**.

4 SLOT EXPANDER & 80 COLUMN BOARD $49.95

Now you program 80 COLUMNS on the screen at one time! Converts your Commodore 64 to 80 COLUMNS when you plug in the 80 COLUMN EXPANSION BOARD!! PLUS 4 slot expander! ***Limited Quantities.* Sale $49.95.** *Coupon $39.95*

80 COLUMNS IN COLOR PAPERBOCK WRITER 64 WORD PROCESSOR $29.95

This PAPERBOCK WRITER 64 WORD PROCESSOR is the finest available for the COMMODORE 64 computer! The ULTIMATE FOR PROFESSIONAL Word Processing, DISPLAYS 40 or 80 COLUMNS IN COLOR or black and white! Simple to operate, powerful text editing, complete cursor and insert/delete key controls line and paragraph insertion, automatic deletion, centering, margin settings and output to all printers! List $99.00. **SALE $29.95.**

SPECIAL SOFTWARE COUPON

We pack a SPECIAL SOFTWARE DISCOUNT COUPON with every COMMODORE 64 COMPUTER, DISK DRIVE, PRINTER, or MONITOR we sell! This coupon allows you to SAVE OVER $250 OFF SALE PRICES!!

(Examples)

PROFESSIONAL SOFTWARE COMMODORE 64

Name	List	Sale	Coupon
PaperClip	$59.95	$34.95	$29.95
Consultant	$59.95	$49.95	$39.95
Leader Board	$39.95	$24.95	$22.95
The Print Shop	$44.95	$27.95	$26.95
Halley's Project	$39.95	$22.95	$19.95
Practicalc (spread sheet)	$59.95	$19.95	$14.95
Voice Command Module	$79.95	$39.95	$34.95
Nine Princes in Amber	$32.95	$24.95	$21.95
Super Bowl Sunday	$35.00	$22.95	$19.95
Flip and File Disk Filer	$24.95	$14.95	$12.95
Pro Joy Stick	$19.95	$12.95	$10.00
PartyWare	$19.95	$14.95	$11.95
Dust Cover	$ 8.95	$ 6.95	$ 4.60
Financial Planner Sylvia Porter	$59.95	$38.95	$35.95
Hardball	$29.95	$18.95	$16.95
C64 Troubleshoot & Repair Guide	$24.95	$15.95	$12.95

(See over 100 coupon items in our catalog)

Write or call for Sample SPECIAL SOFTWARE COUPON!

ATTENTION

Computer Clubs

We Offer Big Volume Discounts

CALL TODAY!

PROTECTO WARRANTY

All Protecto's products carry a minimum 90 day warranty. If anything fails within 90 days from the date of purchase, simply send your product to us via United Parcel Service prepaid. We will IMMEDIATELY send you a replacement at no charge via United Parcel Service prepaid. This warranty proves once again that ***We Love Our Customers.***

C128 COMPUTER & 1571 $499.00

Now you can get the C128 Commodore computer & the 1571 Disk Drive for one low price of only $499.00. List $698.00
SALE $499.00.

340K 1571 COMMODORE DISK DRIVE $259.00

Double Sided, Single Disk Drive for C-128 allows you to use C-128 mode plus CPM mode. 17 times faster than 1541, plus runs all 1541 formats. List $349.00. **Sale $259.00.**

SUPER AUTO DIAL MODEM $29.95

Easy to use. Just plug into your Commodore 64 computer and you're ready to transmit and receive messages. Easier to use than dialing your telephone, just push one key on your computer! Includes exclusive easy to use program for up and down loading to printer and disk drives. ***Best in U.S.A.*** List $99.00. **SALE $29.95.** *Coupon $24.95.*

VOICE SYNTHESIZER $39.95

For Commodore-64 computers. Just plug it in and you can program words and sentences, adjust volume and pitch, make talking adventure games, sound action games and customized talkies!! PLUS ($19.95 value) TEXT TO SPEECH program included FREE, just type a word and hear your computer talk — ADD SOUND TO "ZORK", SCOTT ADAMS AND OTHER ADVENTURE GAMES!! (Disk or tape.) List $89.00. **SALE $39.95**

12" MAGNAVOX (NAP) 80 COLUMN MONITOR WITH SOUND $79.95

Super High Resolution green screen monitor. 80 columns x 24 lines, easy to read, plus speaker for audio sound included. Fantastic value. List $129.00. **Sale $79.95.**
(C128 cable $19.95. C64, Atari cable $9.95)

PRINTER/TYPEWRITER COMBINATION $229.95

"JUKI" Superb letter quality, daisy wheel printer/typewriter combination. Two machines in one — just a flick of the switch. 12" extra large carriage, typewriter keyboard, automatic margin control and relocate key, drop in cassette ribbon! (90 day warranty) centronics parallel or RS232 serial port built in (Specify).
List $349.00. **SALE $229.95.** ***(Ltd. Qty.)***

14" RGB & COMPOSITE COLOR MONITOR $259.95

Must be used to get 80 columns in color with 80 column computers (C128 - IBM - Apple). (RGB Cable $19.95) Add $14.50 shipping.
List $399.00. **SALE $259.95.**

• LOWEST PRICES • 15 DAY FREE TRIAL
• BEST SERVICE IN U.S.A. • ONE DAY EXPRESS MAIL

PHONE ORDERS
8 a.m. - 8 p.m. C.S.T. Weekdays
9 a.m. - 12 noon C.S.T. Saturdays

• 90 DAY FREE REPLACEMENT WARRANTY
• OVER 500 PROGRAMS • FREE CATALOGS

Add $10.00 for shipping, handling and insurance. Illinois residents please add 6¼% tax. Add $20.00 for CANADA, PUERTO RICO, HAWAII, ALASKA, APO-FPO orders. Canadian orders must be in U.S. dollars. WE DO NOT EXPORT TO OTHER COUNTRIES, EXCEPT CANADA. Enclose Cashier Check, Money Order or Personal Check. Allow 14 days for delivery, 2 to 7 days for phone orders, 1 day express mail! Prices & Availability subject to change without notice.
VISA — MASTER CARD — C.O.D. No. C.O.D. to Canada, APO-FPO

PROTECTO

We Love Our Customers

22292 N. Pepper Rd., Barrington, Illinois 60010

312/382-5244 to order

Famous Comstar National Brand

10" Printer Sale

Includes Commodore Interface

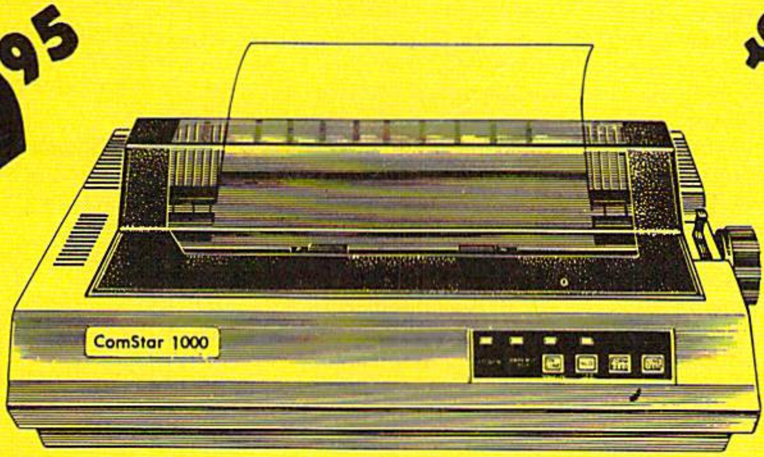
Near Letter Quality *Near Letter Quality*

Best Value in the USA

• 100 CPS draft/20CPS near-letter quality • Dot Addressable Graphics • Adjustable Tractor and Friction Feed • Automatic Paper Loading • Right and Left Margin settings • Pica, Elite, Condensed, Italics • Superscript • Subscript • Underline, Bold print, Double Strike • Superb NEAR LETTER QUALITY

$\$179^{95}$

$\$179^{95}$



Easy to Use

Fantastic Graphics

2 Year Warranty

The Comstar 1000 is one of the best values in the United States today. Print your letters, documents, programs, pictures, and more at a blazing 100 Characters Per Second or 20 cps in the Near Letter quality mode. (Looks just like it came from a typewriter.) Plus, choose your printing mode (NLQ, Draft) from your wordprocessor or by simply pushing the controls on the front panel. Fantastic Quality at a Fantastic Price.List $349.00 **SALE$179.95.**

Print Method
Serial impact dot matrix (9 pin)
Print Speed
Draft- 100 CPS NLQ- 20 CPS
Character Sets
96 ASCII Characters, Marker, Symbols (includes italic font)

Ribbon (Life exp.)
Black: cassette (2.5 million characters)
Dimensions
15.4 (W) x 10.9 (D) x 4.7 (H) inch
Weight
Approx. 10 lbs
Character Spacing
Fixed

Line Spacing
1/6, 1/8, 7/72, and 1/216 inch
Paper Feed
Adjustable tractor and friction feed
Paper feeding Direction
Bi-directional
Copies
2 plus original

Supply is Limited so Buy Today

Add $10.00 for shipping, handling and insurance. Illinois residents please add 6% tax. Add $20.00 for CANADA, PUERTO RICO, HAWAII, ALASKA, APO-FPO orders. Canadian orders must be in U.S. dollars. WE DO NOT EXPORT TO OTHER COUNTRIES, EXCEPT CANADA.

Enclose Cashiers Check, Money Order or Personal Check. Allow 14 days for delivery, 2 to 7 days for phone orders, 1 day express mail!

VISA — MASTER CARD — C.O.D.

No C.O.D. to Canada, APO-FPO.

PROTECTO

We Love Our Customers

22292 N. Pepper Rd., Barrington, Illinois 60010

312/382-5244 to order

Cantus: The Music Improviser

The Commodore 64's versatile sound chip, SID, has inspired a multitude of music software. Like word processors and spreadsheets, most full-range software companies offer music packages many of which are quite sophisticated, with fancy, hi-res screens, and lavishly produced manuals. Some even allow for considerable creativity in letting you program your own tone colors. Nearly all assume that the user wants to be a tunesmith, to create and arrange his own melodies, and perhaps accompany them with other melodies or a bass and drum line.

Cantus is different. It's a semi-random improvisation tool instead of a composer/arranger. It's simple, accessible, interactive power with few "bells and whistles."

Perhaps the main difference between *Cantus* and other music programs is that it was conceived by a professional musician as a creative tool relevant to contemporary music. (Ryo Kawasaki, for *Sight and Sound* software, is the only other professional name that comes to mind in 64 music programming—and his work is unique too, in a quite different way.) The conceptual work on *Cantus* (and writing of the manual) was done by Michael Riesman, musical director and keyboardist of the Philip Glass Ensemble (for more on Michael Riesman, see "Musicians Meet Computers" in the May 1986 issue). Those who know the music of Philip Glass know something of what to expect here. Here is a music of controlled randomness, a music of *process* rather than result, a music of "doing" rather than "done."

Cantus is the fruitful collaboration of Riesman's concept and the technical prowess of Steven Buchwalter, who coded *Cantus* entirely in the C language.

Besides being easily learned and remembered, *Cantus* derives much of its accessibility from the fact that it has only one main screen. This screen contains *all* the stylistic choices—or "patches"—the user makes. (There is an easily accessed store of 37 "canned" patches as well. You have the choice of just sitting back and enjoying them, examining them as instructive examples, using them as "jumping off places," or ignoring them altogether.) The system operates by making choices among the options and probability ranges you specify. As the texture is performing (the only way to describe it), you change Y/N options and distributions on the fly.

Some of the choices relate to tone color (envelope, waveform, filtering, etc.)—of which a considerable range is available (although not *all* the capabilities of the SID chip, as the manual implies). Most, however, are harmony/chord, rhythmic (duration), voice relation (texture), and octave options. All 19 three-note chords (in prototype—the program mixes up voice registers or inversions itself) are available. So are independent, pair, or block textures (along with a rhythmic "offset" option that gives a strummed or arpeggiated effect), choices of duration and rest value (relative distributions), and octave probabilities. The result is a kind of textured music, with the user defining the overall parameters of the style, and the computer making specific random decisions within that style.

Operation is remarkably simple: Cursor to the parameter you want to define (the cursor automatically jumps among active "fields"), enter a value, and press RETURN. LOAD (CTRL-L) an alternate "musical environment" (texture patch) in four seconds—either yours or one included. Start and stop with the RUN/STOP key. If you want to "see" the actual pitches at any particular point (it's rarely necessary), just switch to the alternate screen to see blocks jumping up and down on "octave lines" with pitch names above the blocks (voices are color-coded). Freeze the performance and notation by pressing a function key; resume by releasing the key. It's wonderful to see such interactivity so accessible, easy to learn, and well explained in a manual.

Of course there are a few limitations, even bugs. Of particular note is the difficulty in turning off any of the voices. (In fairness it should be noted that the harmonic/chordal approach implies that all voices should be going most of the time, and that all voices play different pitches—another textural requirement.) The manual suggests setting unwanted voices to *pulse* with a width of zero. Unfortunately, this method gives bothersome clicks. If you go to the trouble of specifying envelope values A, D, and R to 15, however, the clicks will completely disappear.

It's annoying (and perhaps unintended) that pressing HOME sends the disk drive into an abortive save, and that the DELete key takes you to the HOME position. Otherwise the programming is notably bug-free.

Cantus is both educational and lots of fun. Like the environment of LOGO, it has great possibilities for creative play by children. Loading and saving patches are very fast (files are only four blocks each), and *Cantus* loads with Epyx' *FastLoad* cartridge in only 35 seconds (almost two minutes normally).

An extensive set of Library utilities is also included to perform all the disk functions normally involved in this sort of program. This too helps make *Cantus* easy to use for quick results. There is a minimum of technical obstacles. The four-page musical glossary of terms is most welcome, and the well-organized documentation is both succinct and well-written.

It's worth making a point about the manual because this is a "cottage" product, home produced and marketed—a beautiful example of what you might do yourself. Pages are duplicated (single side) on a regular copier and assembled under a translucent plastic cover with a friction plastic grip. The single disk is double-side taped to the inside back cover, and an index card flap taped over the top so the disk won't fall out. Low cost, effective, neat, clear, well-organized—a model "cottage" product.

Cantus is a significant and unique music package. It's inviting, involving, and contemporary. For creative play, process interaction, and music education applications, it's hard to beat. I highly recommend it for participation in a unique musical environment.

—*Art Hunkins*

Algo-Rhythm Software
176 Mineola Blvd.
Mineola, NY 11501
$39.95

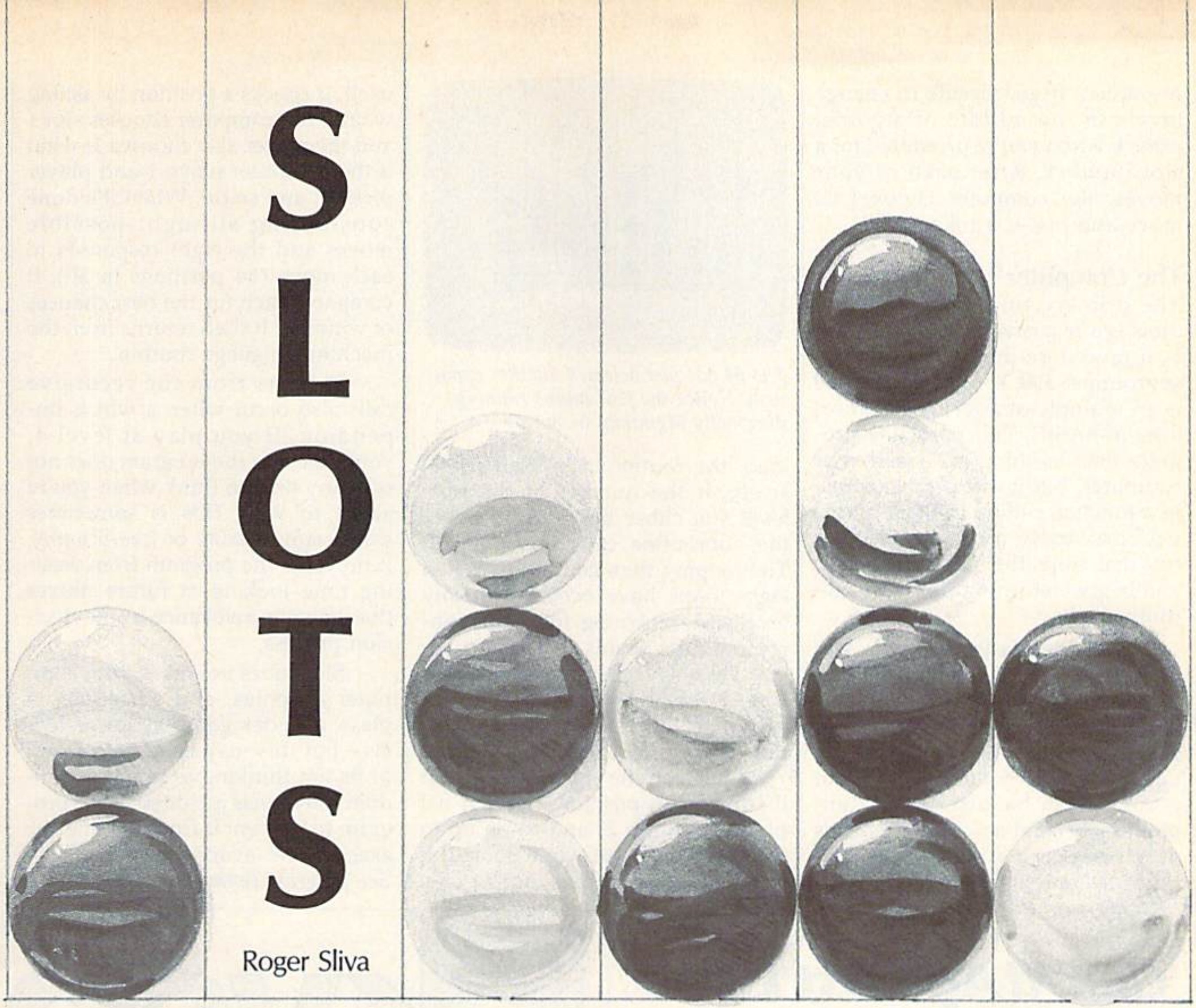
COMPUTE!'s Gazette is looking for utilities, games, applications educational programs, and tutorial articles. If you've created a program that you think other readers might enjoy or find useful, send it, on tape or disk to:

Submissions Reviewer
COMPUTE! Publications
P.O. Box 5406
Greensboro, NC 27403

Please enclose an SASE if you wish to have the materials returned. Articles are reviewed within four weeks of submission.

SLOTS

Roger Sliva



Your computer is a formidable opponent in this battle of wits. An excellent strategy game with four skill levels. For the 64, Plus/4, and 16.

Can you outsmart your computer? "Slots" is a strategy game which challenges you to out-think your machine. You and the computer take turns dropping tokens into a box with eight vertical slots. To win, you must get four of your tokens in a row vertically, horizontally, or diagonally. Or you can win by being first to put a token at the top position of any slot in the box. Each time you select one of the eight rows in which to place a token, it's dropped to the lowest available position in that slot. Each slot is then filled from bottom to top during play. The game is tricky, though: What often seems to be a good move might be just the stepping stone the computer needs to win.

Slots is written in BASIC, but the decision-making process is written in machine language, and is found in the DATA statements in the latter section of the program listing. The program runs on the Commodore 64, Plus/4, and 16. To get started, type in the program using "The Automatic Proofreader," found elsewhere in this issue. When you're finished typing, be sure to save a copy. To play the game, load it and type RUN. After a brief wait, you're asked if you wish to go first. Press Y (for yes) or N if you'd rather the computer start. Going first is not necessarily an advantage.

You're then asked to select a playing level, 1–4. The level you choose determines the number of moves ahead the program looks. At level 1, the computer looks only at its next move. At level 2, the computer looks at its next move and your next possible move. At level 3, it looks one step beyond level 2, and at level 4, another step beyond. Each move has a maximum of eight possible positions, with each position having eight possible future positions. At level 4, the computer looks at a maximum of 4,096 possible positions. For that reason, level 4 takes a bit longer (only several seconds actually).

If you have a 128, try adding the following lines to speed up the program in 64 mode:

```
61  POKE 53296,0
471 POKE 53296,1
```

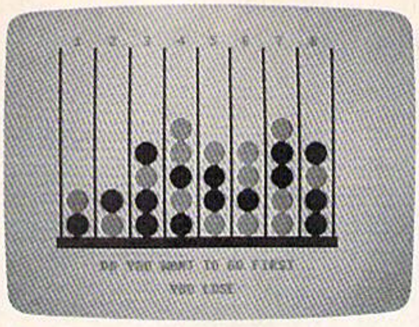
(The second POKE speeds up the 128's 8502 chip to 2 MHz, and the first POKE resets it to 1 MHz, the normal processing speed of the 64. If you include these POKEs, the initial screen fills with garbage for about 20 seconds while the characters are being redefined. This is normal.)

After entering the play level, the game screen appears. Just type the slot number, 1–8, when prompted. If you decide to change levels in the middle of a game, press L when you're prompted for a slot number. After each of your moves, the computer chooses its move and places a token.

The Computer's Intelligence

The primary thinking routine in Slots is a *recursive* procedure—that is, a procedure that calls itself as a subroutine. **100 X=1: GOSUB 100** is an example of a recursive procedure in BASIC. This particular program does nothing but crash your computer, but it offers an example of a function calling itself. A meaningful recursive procedure needs a test that stops the subroutine calls, and begins returning from the subroutine calls.

Slots runs faster and uses less memory by using a recursive function. At each possible move position, the program looks at the eight positions that could occur on the next move. Each one of the eight positions can be answered by another eight, and so on. Slots needs only one routine that loops eight times to look at each slot. In each loop, the routine calls itself recursively. If the number of the play level you chose has been reached, the subroutine calls are stopped. The looping then continues. When eight loops have occurred at any level, the returning from the subroutine calls begins.



DO YOU WANT TO GO FIRST

YOU LOSE

The 64 has just defeated another opponent. Notice the four tokens running diagonally beginning in slot 4.

Let's say you choose to play level 2, which means the recursion goes two levels deep. To analyze the board, the computer calls the "what if" routine eight times: What if I played in position 1? What if I played position 2? and so on up to slot number 8. But while it's in the middle of a what if, the routine calls itself. It checks a position by asking what if the computer chooses slot 1 and the player also chooses 1; what if the computer plays 1 and player picks 2; and so on. When it's done considering all eight possible moves and the eight responses to each move (64 positions in all), it compares each for the best chances of winning. It then returns from the machine language routine.

Returns from the recursive calls also occur when a win is impending. If you play at level 4, you'll see that the program does not take any time to think when you're about to win. This is sometimes called *mini-maxing* or *tree-pruning.* It prevents the program from wasting time looking at future moves that have no relevance to the decision process.

Slots does not make your computer a genius, and sometimes it plays a better game at lower levels—but this may come as a result of its not thinking as much. A random function is included in the program to prevent it from making the exact moves every time.

See program listing on page 100.

Guard Against Life's Little Accidents

With *MICRO DOCTOR, Care, Troubleshooting and Simple Repair for your Commodore 64®* by Hoyt Hilsman, you can prevent 90% of common microcomputer maintenance ills and treat 50% of your problems using household tools.

Micro Doctor
The First Name in Computer Health

Little, Brown and Company
Boston, MA 02108

$13.95
ISBN 36413

To order call
800-343-9204

kyan
PASCAL
For the Commodore 64

kyan pascal is the most complete package available for learning and using the Pascal language.

kyan pascal is easy to use, lightning fast, and loaded with features. It's a full Pascal implementation. It compiles and runs many times faster than other Pascal compilers.

kyan pascal features:
- Optimized Machine Code Compiler;
- Built-In Full Screen Text Editor;
- String-Handling, Chaining, Include File, and Other Powerful Extensions;
- Random Access Files and Full Graphics Support;
- Built-In Assembler (Allows Full Hardware Control);
- 13-Digit Arithmetic Precision; and,
- Tutorial Manual with Sample Programs.

kyan pascal requires 64K of memory and a single disk drive. No additional hardware is necessary. And, it comes with kyan's MONEY BACK GUARANTEE... **If not completely satisfied, return it within 15 days for a full refund.**

kyan pascal for the C64 .... $69.95
(Add $4.50/copy for handling; $12.00 outside North America; California residents add $4.55/copy for sales tax)

Send Check/Money Order to:
Call: (415) 775-2923
MC/Visa Accepted

kyan software, Dept. X
1850 Union St., Ste. 183
San Francisco, CA 94123

BRAND NEW FROM CSM!!

SNAPSHOT 64 ENHANCEMENT DISK

A must for every SNAPSHOT 64 owner!

SNAPSHOT 64 owners, you know it's the best backup cartridge available. We thought the best would be good enough, but you wanted more. Now the SNAPSHOT 64 ENHANCEMENT DISK gives it to you! The most requested utilities and aids are included in this affordable, easy-to-use package. Look at what you get:

FAST LOADER - Add CSM's own fast loader to your SNAPSHOT 64 backups. Loads your backups several times faster! Works with 1541, 1571 and "1541-clone" drives.

CARTRIDGE MAKER - All the software you need to install your SNAPSHOT'ed program on a bank-switch cartridge board. Downloads and runs in seconds! Perfect for business programs or your most-used utilities! All the EPROM supplies you'll need are available separately from CSM.

UPDATED BOOT - Allows SNAPSHOT 64 to handle many new (and some old) programs! Automatically included in the FAST LOAD and CARTRIDGE MAKER options or can be used separately. No need to re-SNAPSHOT your originals!

INVESTIGATIVE UTILITIES - For the "hacker" type. If you're using SNAPSHOT 64 to explore program protection or operation, you need these aids. Uncompress the main files so you can investigate and modify them. Then recompress the new versions and they'll be booted as usual.

COMPREHENSIVE MANUAL - Covers the ENHANCEMENT DISK utilities plus full information on the various SNAPSHOT files.

All this for only $14.00 plus shipping

SNAPSHOT 64

The original cartridge! Takes a "snapshot" of your original program, saves it to disk and adds an autoboot. Your program can be interrupted at almost any point and restarted at the exact same point! The fastest, easiest-to-use and most effective utility of its kind! Backups do not require the cartridge to run, and are compatible with most fast load cartridges (or see ENHANCEMENT DISK above).

$49.95 plus shipping

1541 DISK DRIVE ALIGNMENT PROGRAM VERSION 2.0

Still the best! No special tools or knowledge required, just average mechanical ability. See the review in the Oct. 1984 *Compute's Gazette* and all the other top magazines.

Still only $44.95 plus shipping

EPROM PROGRAMMERS HANDBOOK

A must if you're programming EPROMs! Covers the important concepts in a readable style. The accompanying diskette includes many useful utilities. Put up to 10 programs on a single cartridge, with a menu added automatically! Modify the KERNAL and DOS ROMs! Much more!

Book plus diskette for only $32.95 plus shipping

THE SOURCE GENERATOR

A SYMBOLIC DISASSEMBLER that turns ML into assembly language, complete with labels. Choice of PAL, CBM or MAE formats. Disassemble 6502, 6511 (MSD), 65C02 or undocumented opcodes. Fast and easy to use.

$34.95 plus shipping

PROGRAM PROTECTION MANUAL, VOLUMES I & II

Vol. I is for the beginner and covers bad blocks, disk directories and BASIC. Volume II is more advanced - over 265 pages on encryption, GCR code, nonstandard formats, advanced cartridges and much, much more!

Vol. I - $29.95, Vol. II - $34.95
Disk included with each.

CARTRIDGE BACKER II

New auto-parameter system archives more programs than ever. Backs up cartridge to disk and adds autoboot. Backups run from disk - NO special hardware required.

$54.95 plus shipping.
Update for prior purchaser only $14.00

CSM Software, Inc.

P.O. Box 563, Crown Point, IN 46307
(219) 663-4335

VISA AND MASTERCARD ACCEPTED *DEALER INQUIRIES INVITED*

TRY THIS ON FOR SIZE.

At the United States Space Camp, you'll have to. It's required attire, you see, in your training for a Space Shuttle mission. You'll be piloting a shuttle simulator, working under weightless conditions, doing what most people only see on the six o'clock news.

PROJECT: SPACE STATION

Our space station construction software, can get you to Space Camp for the time of your life. You'll need to get your hands on it and build us your best station.

We'd like to see you in this suit. Soon. See your favorite software dealer for a Space Camp Scholarship booklet and construction guidelines, or write to us at the address below.

HesWare

P.O. Box 631-SCS
So. San Francisco, CA 94080
(415) 871-0570

CHOPPER 1

Mike Sedore

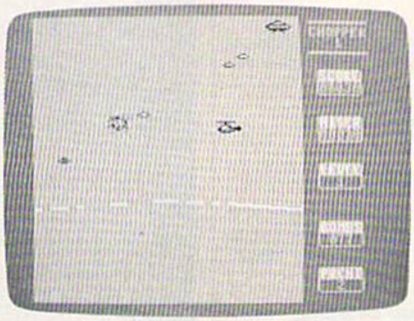
Only quick maneuvering and accurate firing can save the day in this fast-action, arcade-style game. For the Commodore 64. A joystick is required.

As the sole trained pilot for the army's top-secret "Chopper 1," an attack helicopter equipped with a powerful pulse laser, you're sent to defend your city when it's suddenly invaded by aliens. The city's other defense is a glowing force field which hovers above the skyline. The alien's spaceship passes back and forth over the city while continually dropping bombs which gradually blast their way through the force field and, eventually, into the city itself. The bombs will also destroy your chopper if contact is made. You've been sent to destroy the bombs with Chopper 1's laser before they reach the city. The alien's spacecraft is made of an indestructible alien alloy, and it's invulnerable to your laser blasts. It will, however, destroy you if you get in its path.

You control Chopper 1 with a joystick (in port 2). You can move the helicopter left, right, up, or down with the joystick—and you can fire the laser by pressing the fire button.

Save The City

The spaceship is armed with 100 bombs. Should any part of the city remain standing when its supply of bombs is exhausted, you'll receive a bonus which will be added to your score. The greater the amount of the city remaining, the higher the bonus. You'll then move on to save another city and to a higher skill level where the bombs drop faster. You receive 10 points for each bomb you destroy.



The player has just destroyed a bomb. Notice that the alien spacecraft has just released two more above Chopper 1.

Should a city be totally destroyed before the alien's bomb supply is exhausted, no bonus will be awarded, and you're given the chance to save another city at the same skill level.

When you see the message GAME OVER, you can select the level at which you wish to begin by pushing the joystick up or down to change the skill level. Press the fire button to start the game.

The army has a supply of four Chopper 1 helicopters, the first three of which are equipped with emergency escape parachutes. Should the aliens destroy your helicopter, the escape parachute will automatically activate, and you'll land safely. If the fourth Chopper 1 is destroyed, all is lost. The game ends. You'll find it difficult to maintain your choppers for very long at the higher skill levels.

Typing It In

Since "Chopper 1" is written entirely in machine language, you'll need to enter the program with "MLX," found elsewhere in this issue. Load and run MLX, and when prompted for starting and ending addresses, enter the following:

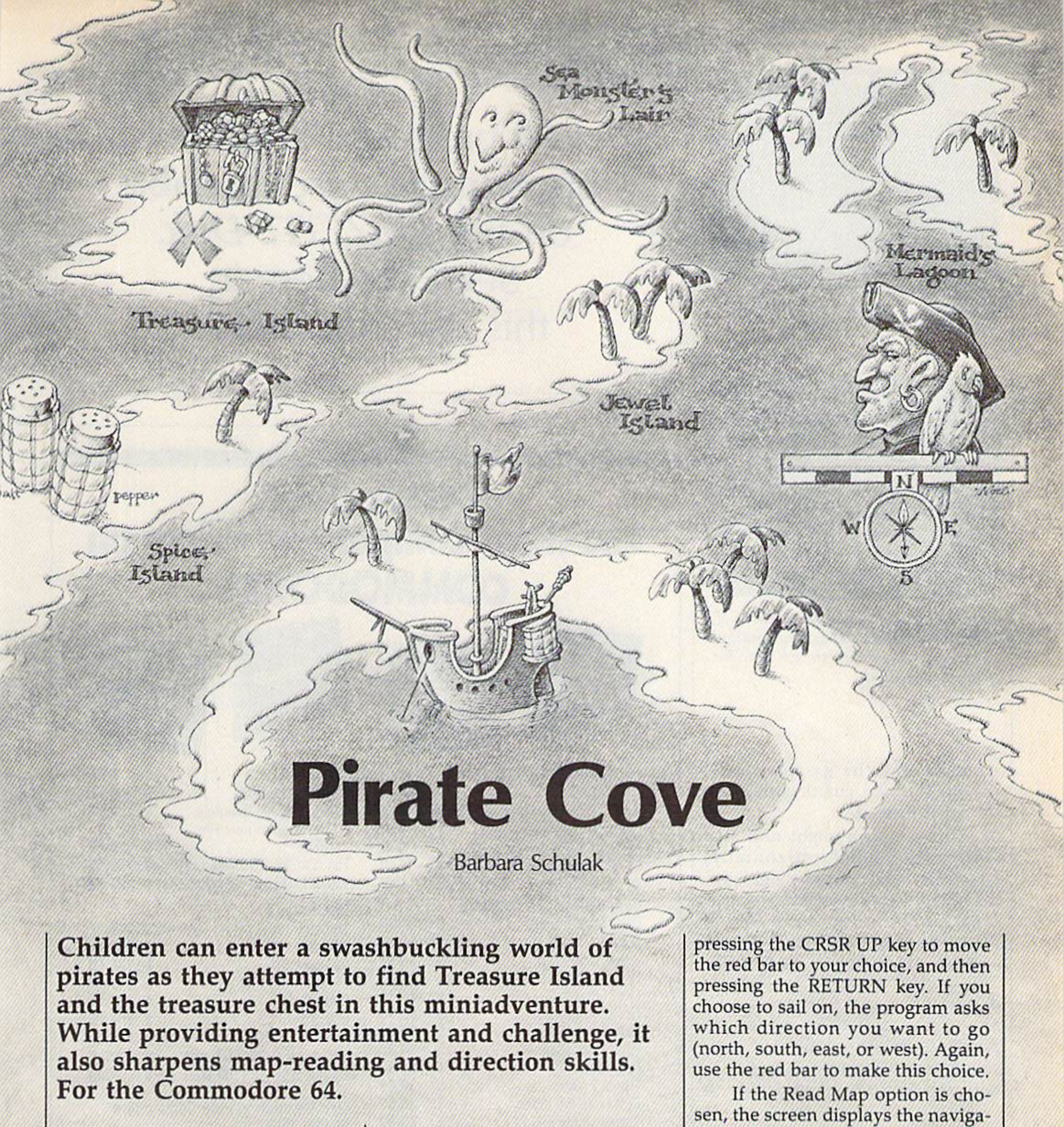
Starting Address: 0801
Ending Address: 175F

Be sure to save a copy when you've finished typing it in. To play the game, load it (LOAD "*filename*",8) and type RUN. Be sure to have a joystick in port 2. Press the fire button to begin play.

If you'd rather not type in the program, send a blank disk, $3, a self-addressed mailer, and 50 cents to cover postage (no U.S. stamps, please) to:

Mike Sedore
27 Melbourne St.
Hamilton, Ontario, Canada
L8P 2A5

See program listing on page 95.



Pirate Cove

Barbara Schulak

Children can enter a swashbuckling world of pirates as they attempt to find Treasure Island and the treasure chest in this miniadventure. While providing entertainment and challenge, it also sharpens map-reading and direction skills. For the Commodore 64.

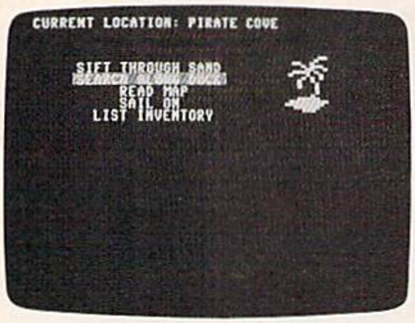
In "Pirate Cove," your child plays the role of a buccaneer who's found a map showing the locations of ten islands. Starting from Pirate Cove, he or she must navigate around the territory trying to find Treasure Island. Along the way, the child may find Spice Island, Mermaid's Lagoon, or Skeleton Island, among others. Also, the child may search sunken ships or fight the Sea Monster. The game is over when Treasure Island has been found and the treasure chest successfully opened.

Playing the game is quite simple. In fact, older children may be able to play the game without instructions. After typing in the program, save a copy. To play, load the program and type RUN.

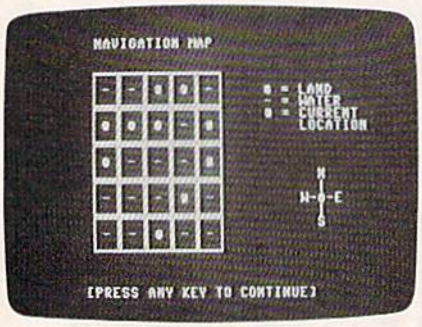
At each land location on the map you're offered five options. Two of these options involve searching the area. The third choice is to read the map, the fourth to sail on, and the last choice to list what you have in your possession (inventory). Make your selection by pressing the CRSR UP key to move the red bar to your choice, and then pressing the RETURN key. If you choose to sail on, the program asks which direction you want to go (north, south, east, or west). Again, use the red bar to make this choice.

If the Read Map option is chosen, the screen displays the navigational map. Islands are indicated by green, water by blue, and your current location by yellow. Choosing the List Inventory option allows you to see what items you've gathered on your journey. (A few of these can be quite helpful.) When you're sailing (the High Seas option), you may choose either to read the map or to sail on.

Each time the program is run, the location of the islands changes so that the game may be played often. More advanced players might



Children can easily play "Pirate Cove" with simple menu selections.



Reading the map shows the location of your ship and the islands. The location of the islands is different each time the game is played.

want to play the game without reading the map, charting their way on paper instead.

Programmers might note that sprites (expanded horizontally) have been used to form a highlighting bar for input of choices. In writing a program for children, it's essential to make the input for them as easy and foolproof as possible. This method seemed a good choice despite making the program a bit longer. I've also used sprites (expanded both horizontally and vertically) for the various pictures.

See program listing on page 98.

COMPUTE!'s GAZETTE
TOLL FREE
Subscription
Order Line
1-800-247-5470
In IA
1-800-532-1272

All programs listed in this magazine are available on the *GAZETTE Disk*. See elsewhere in this issue for details.

Dallas Direct
The Most Competitive Prices on COMMODORE

COMPUTERS SOFTWARE ACCESSORIES PRINTERS

Commodore Products	
C128 Computer	$ Call
C1571 Disk Drive	$ Call
C1902 RGB Monitor	$ Call
MPS 1000 Printer	$ Call
C1700 128K RAM	$ Call
C1750 512K RAM	$ Call
Commodore 128 Software	
CMS Accounting	$ 139.95
SuperBase 128	$ 64.95
SuperScript 128	$ 54.95
Epyx Multiplan	$ 42.95
Fleet System 2	$ 44.95
Fleet System 3	$ 49.95
PaperBack Writer	$ 34.95
PaperBack Planner	$ 34.95
PaperBack Filer	$ 34.95
Freeze Frame	$ 39.95
Fast Load Cartridge	$ 23.00
Vorpal Utility Kit	$ 23.00
Matrix (C128 Utility)	$ 49.95
Bobs Term Pro 128	$ 59.95
Commodore 128/64 Accessories	
Anchor 6480 Modem (New)	$ 149.95
PPI SuperSketch	$ 19.95
PPI Joystick	$ 8.95
DSI-PPI Interface	$ 39.95
Tymac Parallel Interface	$ 59.95
C128 Programmers Ref. Guide	$ 19.95
Fuji 5¼" DS/DD Diskettes (Bx)	$ 12.95
Fuji 3½" DS/DD Diskettes (Bx)	$ 26.95
Printer Sale	
Transtar 120	$ 219.95
Transtar 130	$ 294.95
Cardco LQ-1	$ 184.95
CBM 6400 (40 cps)	$ 349.95
Star SG-10C	$ 229.95
Star SG-15	$ 364.95
Star NX-10 **(New)**	$ 249.95
Citizen MSP-10 (160 cps)	$ Call
Citizen MSP-15 (160 cps)	$ Call
New Computers from Commodore	
PC10 & PC20 (IBM PC Compatibles)	$ Call
C-64C NEW Low Profile 64 with GEOS	$ Call
C1541C NEW Low Profile 1541	$ Call

ORDERING INFORMATION:
Order TOLL FREE **1-800-233-6081**
Others Call (214) 247-7373
Visa/Master Card — C.O.D. or
Prepaid Orders Accepted
Same Day Shipments • All Products
Shipped F.O.B. Dallas, Texas
Call and Order Today!

1-800-233-6081
DALLAS DIRECT
"We used to work for Commodore now we work for you!"
3208 Beltline Road Ste. 210
Dallas, Texas 75234

Address Cataloger

Kevin Mykytyn

There are other address file programs for the Commodore 64, but we haven't seen one this fast, versatile, and easy to use. "Address Cataloger" offers a number of useful features, including a directory, string search and multiple search, alphabetical sort, and several printout formats. Menu operations make it especially easy to manage.

"Address Cataloger" is a specialized database designed to maintain an up-to-date file of names, addresses, telephone numbers, and any special notes you may want to add for each entry. Written for the Commodore 64, it includes a number of useful features not frequently found in programs of this kind: a view of the disk directory, an instant search for any group of characters, alphabetical sorting, and a printer option with your choice of three information formats. And it's written entirely in machine language—so all operations are extremely fast.

Typing It In

To enter the program, you'll need "MLX," the machine language entry program elsewhere in this issue. Be sure you read and understand the instructions for MLX before you begin entering the data for Address Cataloger. When you first run MLX, you're asked for the starting and ending addresses. The correct values are:

Starting Address: 0801
Ending Address: 1458

Next, begin entering the data for Address Cataloger. When you've finished typing it in, be sure to use the MLX Save option to make at least one copy of the program. To use Address Cataloger, simply load it and type RUN as you would for a BASIC program.

The Menu

When you run Address Cataloger, a menu appears:

LOAD DATA
SAVE DATA
DIRECTORY
VIEW DATA
SEARCH DATA
ALPHABETIZE
PRINT DATA
QUIT

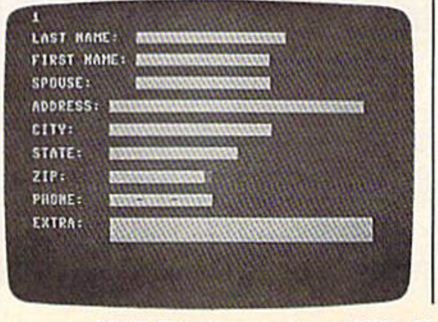
A red highlighting bar appears over the first choice, LOAD DATA. To make a selection, use the up/down cursor key to move the bar to one of the items and press RETURN. Let's look at each of the menu choices and see how to use them.

LOAD DATA: Use this option to load a previously saved address file. (If you're using disk, it's a good idea to save your files on the same disk as Address Cataloger—you'll be able to check the filenames by selecting DIRECTORY, the third choice on the menu.) After pressing RETURN, you're prompted to press T for tape or D for disk. You're then prompted to enter a filename—up to 12 characters are accepted. Disk users may use the wildcard (*) convention for filenames; KIW* will load the first file beginning with the letters KIW, for example, whether it's KIWANIS or KIWIFRUIT. If you wish to abort the load, just press RETURN without entering a filename—you're automatically returned to the menu.

SAVE DATA: After you've entered data and want to save it, cursor to this item on the menu. The procedure is identical to LOAD DATA, described above. If you're saving a large file, make sure you have enough room on the disk or tape. Address Cataloger allows a maximum of 230 records per file. (Disk users should note that 230 records will use 182 blocks of disk space.) If you save a file to disk with the same name as a previously saved file, the new file will replace the old one.

DIRECTORY: This option is for disk users only. When you press RETURN, the names of files created and saved by Address Cataloger are displayed; unrelated filenames are not displayed. If a large number of filenames appears and begins scrolling, you can pause the list by pressing the SHIFT or CTRL keys.

VIEW DATA: This puts you in the data entry and editing section of the program. After pressing RETURN, a screen appears:



```
1
LAST NAME:
FIRST NAME:
SPOUSE:
ADDRESS:
CITY:
STATE:
ZIP:
PHONE:      -   -
EXTRA:
```

```
MICHAEL SANTORO                         215-555-0719
LISA
489 CRESTWOOD DRIVE
MERCERVILLE, PA
19027
CHRISTMAS CARD/BIRTHDAY:JULY 12
CHILDREN: CHRIS AND DANNY

MICHAEL SANTORO                         215-555-0719
LISA
489 CRESTWOOD DRIVE
MERCERVILLE, PA
19027

MICHAEL SANTORO
489 CRESTWOOD DRIVE
MERCERVILLE, PA
19027
```

Three printing formats are available with "Address Cataloger": The first includes all information (name, address, phone, and two lines of extra information), the second prints all data except the extra information, and the third format, for address labels, prints a name and address only.

Notice the record number displayed in the upper left corner of the screen. There are 18 key combinations you can use for a variety of editing functions:

CTRL-A. Abort. If you're in the process of editing a record and decide to keep the original data, CTRL-A (the CTRL key and A pressed simultaneously) aborts the current editing changes and restores the data most recently saved for that record.

CTRL-D. Delete. This deletes the record currently displayed and numerically adjusts all subsequent records. For example, if you delete record 15, record 16 becomes record 15, 17 becomes 16, and so on.

CTRL-I. Insert. This moves the displayed record and all subsequent records up one (15 becomes 16, and so on) so you can insert a new record—for example, Morris between Miller and Muller. The Insert function will not work if the file is full (if it already contains 230 records).

CTRL-F. Find. This option can be used only after SEARCH DATA is selected from the menu. It displays the next record that matches the *search string* (see SEARCH DATA below).

CTRL-P. Print. This option can be used only after PRINT DATA is selected from the menu. It prints the displayed record in the selected format (see PRINT DATA).

SHIFT-+. Next Record. By pressing the SHIFT and plus-sign (+) keys, the current record is stored in memory and the next record is displayed.

SHIFT-−. Previous Record. The SHIFT and minus-sign (−) key combination enters the current record into memory and displays the previous record.

Commodore-+ or **Commodore-−**. Skip Ten Records. Press the Commodore key and the + or − key to skip ahead or back ten records. For example, if you're on record 36, Commodore-+ will display record 46. In the same situation, Commodore-− will display record 26.

DEL. Backspace. Press the DELete key to erase the character to the left of the cursor.

←. Delete. The left-arrow key (the upper left key on your keyboard) moves all characters to the right of the cursor one space to the left.

INST. Insert. This key (SHIFT-INST/DEL) moves all characters under and to the right of the cursor one space to the right.

RETURN. Next Field. Press RETURN to move the cursor to the beginning of the next field.

CRSR-DOWN. Next Field. Same as RETURN.

CRSR-UP Previous Field. This key moves the cursor to the beginning of the previous field.

RUN/STOP. Return to Menu. This key enters the currently displayed record into memory and then displays the menu. (If SEARCH DATA was selected from the menu, RUN/STOP activates the search—see SEARCH DATA below.)

HOME. Clear Field. This key clears the field containing the cursor.

CLR/HOME. Clear Record. This key (SHIFT-CLR/HOME) erases all data in the record displayed. (It can be restored immediately with CTRL-A.)

SEARCH DATA: When you choose to search through the file, the data entry screen appears, as previously shown. Enter any combination of characters—a *search string*—in any field. Just type in the string you want to search for in the appropriate field and press the RUN/STOP key. (For example, a MAS in the Last Name field will find THOMAS, a 414 in the Phone field will find anyone in the 414 calling area, or CHRISTMAS in the Extra field will find anyone you wish to include on your Christmas card list—if you've set up your file for this purpose.)

When a match is found, the record is displayed. If you wish, you can edit any part of the record. To find additional matches, press CTRL-F. If no more matches are found, you'll notice that the record number has not changed. You can do multiple searches also—for example, SMITH, LOS ANGELES in their respective fields.

If no matches are found, the screen displays NO MATCH and PRESS ANY KEY. The menu reappears after pressing a key.

ALPHABETIZE: This option sorts all records alphabetically by last name. In the case of identical last names, the sort will look at first names and alphabetize accordingly. For example, if you have five Smiths in your address file, they'll be alphabetized under Smith by first name: Al, Dorothy, Mike, Richard, and Walter.

You can also use this option to clean up your file from time to time. After you've used the file for a while, you're likely to have some blank records. By alphabetizing, you'll condense your file—the program removes all blank records and renumbers existing files, thus saving space. (It's a good idea to avoid blank records when entering records—a lot of these in your file will slow down program operation.)

PRINT DATA: Before choosing any options from this menu item, be sure your printer is turned on and the paper properly aligned. There are several choices to make before printing out data from an address file. After selecting this option, a small menu appears:

ALL INFORMATION
PHONE LIST
ADDRESS LABELS
MAIN MENU

The first choice, All Information, prints all the data in a file. The Phone List selection prints all data except the information in the Extra field. Address Labels prints all data in the Name, Address, City, State, and Zip fields. When printing address labels, you can adjust the printer linefeed by typing **POKE 5176, x**, where x is the number of linefeeds you want. As written, the program uses six linefeeds. If you wish to make a permanent adjustment, load the program, type this POKE in immediate mode, and resave the program with a new filename. The final choice, Main Menu, provides an easy way to exit from the print option.

After selecting one of the three printing formats, another menu is displayed:

SELECTED
ALL
MAIN MENU

The first choice, Selected, allows you to choose which record or records will be printed. You're presented with the data entry screen (as in the SEARCH DATA option). Enter a search string in the appropriate field(s), and press RUN/STOP. All records that match are then printed out. If you wish to stop the printing after any record, press RUN/STOP.

If the All option is selected, all records are printed out. Again, RUN/STOP will halt the procedure.

If you've selected a printing format (All Information, Phone List, or Address Labels), and then go to the main menu (ignoring Selected or All), you can then print out individual records from within the View Data option by pressing CTRL-P.

QUIT: This option exits the program and returns you to BASIC.

See program listing on page 93.

Expandable Graphics Dump

For The Commodore 1526 And MPS-802 Printers

Fred Solmer

Here's a quick and easy way to get standard- or double-sized high-resolution printouts. The program works with *Print Shop*, *Doodle*, Koala Pad, and other hi-res screens. Versions for the 64, 128, and Plus/4.

The April 1985 issue of COMPUTE!'s GAZETTE contained a useful program titled "1526 Hi-Res Screen Dump," which allowed 64 owners to print out high-resolution screens on Commodore's 1526 or MPS-802 printers—models that aren't normally capable of high-resolution graphics printing. "Expandable Graphics Dump," for the Commodore 1526 and MPS-802 printers *only*, goes a few steps beyond. It provides for column placement of the normal screen dump, allowing it to be printed out anywhere from column 0–40. Also, a blowup option is included. With a single keypress, you can get a printout twice the size (horizontally and vertically) of the normal one. Two hi-res screens could be combined into an 8½" × 11" "poster."

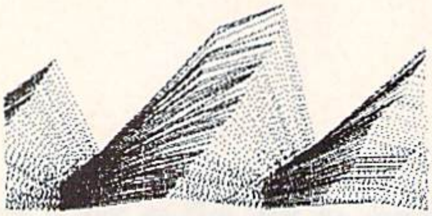
Expandable Graphics Dump works with almost any hi-res screen. The 64 version prints graphics screens created with the *Print Shop* ("Screen Magic" pictures only), *Doodle*, and the Koala Pad. In fact, it's compatible with almost any software designed to make hi-res screens.

A Simple Procedure

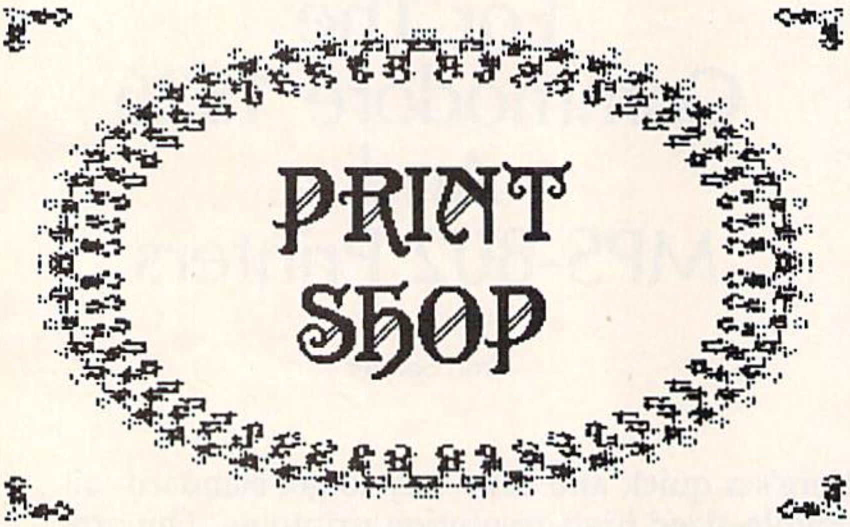
After typing in the version for your computer (Program 1 for the 64, Program 2 for the 128 or Plus/4), be sure to save a copy. Be especially careful when typing the numbers in the DATA statements. (It's recommended that you use "The Automatic Proofreader" to assist you in typing the program correctly.)

Before getting started, be sure your printer is turned on. If you own a 64, first load your hi-res screen as if it were a machine language program:

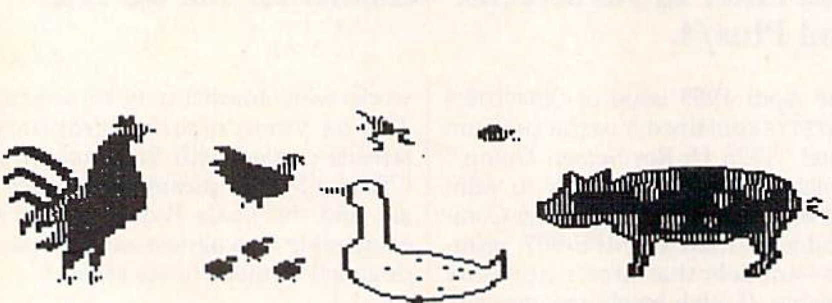
Three Hi-Res Printouts:



A mountain scene from "The Coordinator" (March 1986 GAZETTE*).*



A double-sized printout of a screen created with The Print Shop.



Double-sized printout of barnyard animals created with the Koala Pad (the striped lines in this picture are a side effect of multicolor mode).

LOAD"*screenname*",8,1. You probably won't be able to see it, but it has been loaded into memory. Then type NEW. Next, load Expandable Graphics Dump, and type RUN. The screen prompts make it very easy to use. In the 64 version, you're first asked if the hi-res screen was created by *Print Shop*. After you press the appropriate key, you're asked to choose a normal size or enlarged, double-size printout. After making this selection, you're asked for a "space-over" value, 0–40. A computer screen is 40 columns wide, but the printer has 80 columns. The space-over number controls the number of spaces between the left margin and the printed picture. For example, if you wish your hi-res screen to be printed at the left margin, choose 0. To center it on the page, enter a value of 20.

On the 128 and Plus/4, you may load Expandable Graphics Dump first. Then use the built-in graphics commands to create a picture in GRAPHIC 1 mode. When you're satisfied with the result, load Expandable Graphics Dump (if you haven't already done so) and run it. In this version, you're asked to choose a "1:1" (normal size) or blow-up printout, and then a space-over value, as described above. (The commercial software mentioned above—*Print Shop*, for example—is written for the 64. Commodore 128 and Plus/4 versions of these products are not available at this writing.) On these two machines, you can draw a picture using the built-in graphics commands, exit to the text screen (with GRAPHIC 0), and run the program. It's not necessary to save the picture to disk and load it back into memory.

Note that the 64 version of Expandable Graphics Dump is written for hi-res screens which can be saved as disk files. This restriction means it can't be used to print the greeting cards from *Print Shop*, although it works well with the "Screen Magic" portion of the program. Also, Expandable Graphics Dump handles monochrome hi-res screens somewhat better than multicolor screens. If you look closely at the Koala Pad illustration, you'll see that some colors have been translated to stripes. This is a result of the way the additional colors are stored in the hi-res bitmap.

See program listings on page 106.

machine language for beginners

Turning A BASIC Arcade Game Into Machine Language

Richard Mansfield
Senior Editor

Last month we created a simple BASIC action game that illustrates many of the essential techniques used to write "arcade style" games. Let's finish describing how it works and then translate it into machine language (ML).

```
SC 100 PRINT"{CLR}"
EM 110 PLR = 1054:ENY = 1034:X
         = -1:KE = 212:REM USE
         {SPACE}KE = 203 FOR 64
CG 120 FOR I = 1 TO 24
XD 130 GOSUB 1000:GOSUB 2000
AS 140 NEXT I
KA 150 X = NOT X
CP 160 GOTO 120
HA 1000 POKE PLR,32
BK 1010 IF PEEK(KE)=47 AND PLR
         <1984 THEN PLR = PLR+4
         0
DH 1020 IF PEEK(KE)=44 AND PLR
         >1054 THEN PLR = PLR-4
         0
FP 1030 POKEPLR,219:IFPEEK(PLR
         -20)=209THENPRINTCHR$(
         7):COUNT=COUNT+1:PRINT
         "{HOME}";CO
DA 1040 RETURN
CC 2000 POKE ENY,32
BK 2010 IF X THEN ENY = ENY+40
         :GOTO 2030
RR 2020 ENY = ENY-40
AH 2030 POKE ENY,209
JB 2040 RETURN
```

Line 130 illustrates object weaving. The elements of an action game—all the objects from the alien mothership to the human's attack vessel—must be acting in concert, or the visual effects will appear jerky or worse. In this example game, one obvious design consideration is that each object should take about the same amount of time to compute. The subroutines are accessed so that the player object moves just one space on the screen and then waits until the enemy object takes its turn.

Finally, when the enemy has moved 24 times, it's necessary to reverse its direction. To do this, the *toggle variable* X is switched to its opposite state. In BASIC, a variable is *true* if it has any value other than 0 and *false* if 0. Also, the NOT operator in BASIC can switch a variable between −1 and 0 each time it is used; it will *toggle* the variable, which is exactly what we need to do when signaling whether to move our alien up or down the screen. In the alien-moving subroutine (lines 2000-) we add 40 (one screen line) and thus move the alien downward if X is true (−1). The BASIC expression IF X means "if X does not equal zero." Conversely, the toggle variable causes the program to subtract 40, moving the alien up the screen, whenever X is false (0).

The Player Subroutine

The player- and enemy-moving subroutines are similar in structure, but the player routine does four extra things. It must check for keypresses, look for boundary conditions (is the player moving off the screen?), update and display the score, and make noises during any "hits." In a more complex game, these four jobs might well lead to a time-hogging effect: The time spent in the player routine becomes significantly greater than the time spent processing the other objects in the game. It doesn't happen here, but if it ever should, the programmer would want to balance things out by, perhaps, inserting the task of scorekeeping into the enemy-moving routine, assigning audio effects to another subroutine, score display to yet another, and so forth. The idea is to spread the work around so that nothing becomes lopsided and interferes with the flow of the game.

The first thing we do in the player subroutine is blank out the player character by placing a 32 (blank) into the player's current screen location. Then we check the keyboard by PEEKing the "last key pressed" location. If it's a 47, then the player has depressed the < key to move the player down the screen. We discern that the player isn't going off the bottom of the screen, and then we add 40 to the player-position variable (PLR) if the screen-bottom boundary hasn't been violated.

On the other hand, if the player tries to move up using the > key, we make a similar boundary check first and then subtract 40 from his position. Line 130 POKEs the player character into whatever happens to be his current position. Then we look over to the left 20 spaces and see if the enemy is located there. If so, the player has managed to line himself up with the enemy and gets a point added to his score (that's the goal of the game: keep parallel to the enemy). PRINTing CHR$(7) causes a sound on the 128; making noise on the 64 is slightly more complex, so there's no collision sound in this program for that computer. Finally, the cursor is sent to the HOME position and we print the current score and return to the main loop.

The enemy subroutine also starts off by blanking the character and, based on the value of the toggle variable X, the enemy is moved up or down as appropriate.

Same Program, 100 Times Faster

Now that we've dissected the BASIC version, here's how it would translate into ML. We follow the structure of the BASIC version fairly closely: Matching line numbers indicate that the same task is being accomplished in both versions. There are some extra lines in the ML version because individual programming commands in ML are usually more *particular* than BASIC commands. PRINT "HELLO" in BASIC is broken down into discrete steps in ML: LDA #'H:JSR $FFD2: LDA #'E:JSR $FFD2:LDA #'L...and so forth. Each *letter* of a word is separately sent to the screen. It's 100 times faster than BASIC when

Great Software for Under $7.00...

Now is your chance to build your software library at a *very* reasonable cost! For **ONLY $6.99** you can get software for your Commodore or Apple computer. Choose from entertainment, home management or education titles.

Save $1.00 on a 10-pack of DS/DD **Blank Diskettes** with any merchandise order over $10.00.

For the Commodore 64/128

Entertainment Series

C-1 Memory Quest
C-2 Sky Fighters
C-3 Atomic Challenger
C-4 Professional Gambler
C-5 The Survival Instinct
C-6 Arcade Action
C-7 Adventure Master
C-8 A PACaLIPS NOW
C-9 Bits, Pieces and Clues
C-10 Board Games I
C-11 Board Game Challengers
C-12 Chess Champion
C-13 Crazy Corners
C-14 Galactic Empire Builder
C-15 Just Games (With a Twist!)
C-16 Land, Sea & Air Adventures
C-17 Maze Madness!
C-18 Peg Out (The Cribbage Game)
C-19 Star Trek Evolution
C-20 Trivia Quest
C-21 Open—
  Golfing Royal St. George's
C-22 Alien
C-23 Bulge—Battle for Antwerp
C-24 Wizard & the Princess
C-25 Ulysses & the Golden Fleece
C-26 Mission Asteroid
C-27 Passport to London
C-28 Passport to Paris

Home Management

C-30 Vital Data Keeper
C-31 Wordmaster Senior
C-32 Master Word
C-33 Personal Spreadsheet
C-34 g'BASE, database manager
C-35 My 64—A Computer Tutor
C-36 Commodore 64 Utilities
C-37 Financial Analyzers
C-38 Home and Business Card File
C-39 Home Expense Manager
C-40 Home Finance Organizer 1
C-41 Home Finance Organizer 2
C-42 Home Income Manager
C-43 Home Money Manager
C-44 Home Property Manager
C-46 Personal File Keeper
C-47 Personal Investment Manager
C-48 Family Tree
C-49 Electronic Scheduler
C-50 Pro Financial Organizer
C-51 Recipe Box
C-52 Tax Record Organizer

Education Series

C-53 Number Builder
C-54 Number Chaser
C-55 Hide & Seek
C-56 Picture This
C-57 Let's Count
C-58 Time Trucker
C-59 Fancy Face
C-60 Math Manor
C-61 Typing Tutor
C-62 Speed Reader

Electric Book Co.
Education Series

C-63 Why?
C-64 When?
C-65 The Three Bears
C-66 Gingerbread Man
C-67 Baby Animals
C-68 Hoppy the Curious Kangaroo
C-69 Wild Animals
C-70 Tom Thumb
C-71 I Was a Second Grade Werewolf
C-72 Tough Eddie

For the Apple II+, IIc, IIe

Entertainment Series

A-1 Beginner's Cave, an Adventure
A-2 Cave of the Mind, an Adventure
A-3 River Adventure, an Adventure
A-4 Fore!, Golfing Simulator
A-5 Lady Luck
A-6 Space Adventure
A-7 Classic Games
A-8 Android Invasion
A-9 Championship Gambler
A-10 Chess Champion
A-11 Memory Quest
A-13 Ulysses & the Golden Fleece
A-15 Passport to London
A-16 Passport to Paris

Home Management

A-17 The Addresser—Mailing List
A-18 Financial Planner
A-19 General Ledger
A-20 Monthly Budgeter
A-21 Nutrition Monitor
A-22 Securities Portfolio
A-23 Recipe Box
A-24 Database Manager
A-25 Disk Library
A-26 Electronic Calendar
A-27 Electronic Phone Book
A-28 Family Tree
A-29 Personal Spreadsheet
A-30 JWriter, Word Processor
A-31 Utility Master
A-32 Vital Data Keeper
A-33 Typing Tutor
A-34 Tax Record Organizer
A-35 Checkbook Balancer
A-36 JBase

Education Series

A-37 Mr. Math
A-38 Speed Reading
A-39 Beginning Counting
A-40 Counting Skills
A-41 Addition I
A-42 Addition II
A-43 Addition III
A-44 Addition IV
A-45 Subtraction I
A-46 Subtraction II
A-47 Subtraction III
A-48 Multiplication I
A-49 Multiplication II
A-50 Multiplication III
A-51 Division I
A-52 Division II
A-53 Division III
A-54 Division IV

Electric Book Co.
Education Series

A-55 Why?
A-56 When?
A-57 The Three Bears
A-58 Gingerbread Man
A-59 Baby Animals
A-60 Hoppy the Curious Kangaroo
A-61 Wild Animals
A-62 Tom Thumb
A-63 I Was a Second Grade Werewolf
A-64 Tough Eddie

Plus these Super Accessories

- **Universal Blank Diskettes** (for Apple or Commodore) compatible with any 5¼" disk drive. Double-notched, DS/DD disks give single-sided users *twice* the storage at the same great price! Box of 5: $6.99. **Blank Diskettes:** 100% certified, DS/DD, Box of 10: $8.50.

for Commodore 64/128

- **ShareData 300C™ 300 Baud Modem:** Autodial, autoanswer, includes terminal software: $32.95.
- **Utility Cartridge:** 30 functions: $19.95
- **Warp Drive Cartridge:** Faster loading plus more functions for more efficient use of your computer: $19.95

CALL TOLL-FREE
CREDIT CARD ORDERS ONLY
1-800-257-9411
In Minnesota CALL:
(612) 829-1911

Firstline Software, Inc.
P.O. Box 5297
Hopkins, MN 55343-2297

ENHANCER 2000™ Disk Drive $149.95

plus $8.00 postage/handling

Commodore compatible
floppy disk drive

ORDER FORM

Please list the ordering number(s) (C-1, A-3, etc.) of the program(s) you wish to order and return this order form along with your check, money order or VISA/MasterCard information to: Firstline Software, P.O. Box 5297, Hopkins, MN 55343-2297.

I'm ordering the following programs:

___ ___ ___ ___
___ ___ ___ ___

☐ Check or money order enclosed

U.S. FUNDS ONLY

☐ VISA ☐ MasterCard

Card # ________
Expiration Date ________
Phone ( ) ________
Name ________
Sig. ________ Date ____

Total number of software pkgs. ____ x $6.99 each ...... $____
Boxes of 5 Universal blank disks ____ x $6.99 per box ... $____
Boxes of 10 blank disks ____ x $8.50 per box .... $____
300C 300 Baud Modem ____ x $32.95 per modem ...... $____
Utility Cartridge ____ x $19.95 each .... $____
Warp Drive Cartridge ____ x $19.95 each .... $____
Enhancer 2000 Disk Drive ____ x $149.95 each .... $____
Total amount of order .... $____
Postage/handling (8.00 For Disk Drive; $2.00 For Software) ...... $____
MN Residents add 6% state sales tax .... $____
Total (enclose check, money order or fill in VISA/MC information at left) $____
Money orders/Credit card orders shipped immediately.
Allow 4-6 weeks for delivery for check orders.

Name ________ Address ________
City ________ State ____ Zip ____

GAZ 8

you run it, but ML asks the programmer to use instructions which are not as general-purpose as BASIC instructions.

This program will assemble as is if you are using the LADS assembler from one of my books. The game is designed for the Commodore 64 or 128, but please note the two changes (lines 18 and 110) necessary to adjust things for the 64.

```
1 *= $B00
3 .O
4 ;{12 SPACES}SIMPLE GAME
5 ;
18 PRINT = $FFD2:OUTNUM = $
   8E32; ($BDCD FOR C64)
20 PLRPTR = 250:ENYPTR = 25
   2
100 LDA #147:JSR PRINT;
    {11 SPACES}CLEAR SCREEN
110 PLR = 1054:ENY = 1034:K
    E = 212 ;(203 FOR C64)
111 LDA #<PLR:STA PLRPTR:LD
    A #>PLR:STA PLRPTR+1:LD
    A #<ENY:STA ENYPTR:LDA
    {SPACE}#>ENY
112 STA ENYPTR+1
120 NEXT LDX #24
130 LOOP JSR PLAYER:JSR DEL
    AY:JSR ENEMY
140 DEX:BNE LOOP
150 LDA X:EOR #1:STA X
160 JMP NEXT
1000 PLAYER LDY #0:LDA #32:
     STA (PLRPTR),Y
1010 LDA KE:CMP #47:BNE UP
1011 LDA PLRPTR:CMP #222:BE
     Q MOVE
1012 CLC:LDA PLRPTR:ADC #40
     :STA PLRPTR:LDA PLRPTR
     +1:ADC #0
1013 STA PLRPTR+1:JMP MOVE
1020 UP LDA KE:CMP #44:BNE
     {SPACE}MOVE
1021 LDA PLRPTR:CMP #30:BEQ
      MOVE
1022 SEC:LDA PLRPTR:SBC #40
     :STA PLRPTR:LDA PLRPTR
     +1:SBC #0:STA PLRPTR+1
1030 MOVE LDA #219:LDY #0:S
     TA (PLRPTR),Y
1031 LDY #20:LDA (ENYPTR),Y
     :CMP #32:BEQ RETURN
1032 INC COUNT:BNE SHOWSCOR
     E:INC COUNT+1
1033 SHOWSCORE LDA #19:JSR
     {SPACE}PRINT:LDA #7:JS
     R PRINT:STX XHOLD
1034 LDX COUNT:LDA COUNT+1:
     JSR OUTNUM:LDX XHOLD
1040 RETURN RTS
2000 ENEMY LDY #0:LDA #32:S
     TA (ENYPTR),Y
2010 LDA X:BNE UPEN:CLC:LDA
      ENYPTR:ADC #40:STA EN
     YPTR:LDA ENYPTR+1:ADC
     {SPACE}#0
2011 STA ENYPTR+1:JMP MOVEE
     NY
2020 UPEN SEC:LDA ENYPTR:SB
     C #40:STA ENYPTR:LDA E
     NYPTR+1:SBC #0:STA ENY
     PTR+1
2030 MOVEENY LDA #209:LDY #
     0:STA (ENYPTR),Y
2040 RTS
3000 ;{11 SPACES}SLOW THING
     S DOWN
3010 DELAY LDA #10:STA TIME
     R:LDY #0
3020 MORE DEY:BNE MORE
3030 DEC TIMER:BNE MORE:RTS
4000 ;{11 SPACES}STORAGE AR
     EA
4010 X .BYTE 0
4020 TIMER .BYTE 0
4030 COUNT .BYTE 0 0
4040 XHOLD .BUTE 0
```

Also notice that we had to add a delay subroutine in lines 3000–3030 because, without slowing down the action, no human could hope to play the ML version of the game. This is a byproduct of the great velocities you achieve when you program in ML: You sometimes need to deliberately retard your program or it executes too fast. Another way of looking at ML's exceptional efficiency is that it gives you lots of extra time to insert additional variables or visual effects into the action of the game. You can add more realistic animated graphics, more enemies onscreen at the same time, or whatever else would make your game richer. Many things can be going on at the same time in an ML game—you could even give the enemy "intelligence" by having it seek out the player or anticipate his next move. While these things are possible in BASIC, they eventually make the animation intolerably slow.

Next month we'll take the ML version apart to learn the fundamentals of action-game ML programming. For now, if you want to change its speed, just change the 10 in line 3010 to some other value and reassemble the program.

All programs listed in this magazine are available on the GAZETTE Disk. See elsewhere in this issue for details.

DUST COVERS
★ CUSTOM MADE TO FIT
★ Heavy 32-oz. VINYL ANTI-STATIC
★ EXTENDS EQUIPMENT LIFE
★ Choice of Colors Lt. Tan or Brown

COMPUTERS
C-64; VIC-20; C-16; Plus 4 .... 8.00
C-128, B-128 .... 13.00
DATASETTE (NEW, C2N) 5.00

DISK DRIVES
C-1541; C-1571 INDUS GT 8.00
MSD S/D; APPLE S/D 8.00
MSD D/D; APPLE D/D UNIT 10.00
ENHANCER 2000 .... 8.00

PRINTERS
C-1525/MPS801 .... 10.00
C1526/MPS802 .... 13.00
C/MPS 803; C-1520 .... 8.00
PANASONIC KX-P1090/91 .... 13.00
EPSON MX/RX/FX 80 .... 13.00
GEMINI 10 & STAR 10's 13.00
GEMINI 15 & STAR 15's 16.00
OKIDATA 91/92 .... 13.00
OKIMATE 10 .... 8.00

MONITORS
C-1702 .... 16.00
C-1902/AMIGA 19.00
ZENITH ZVM 122/123 .... 16.00
AMDEK COLOR I, 500/700 .... 19.00
TEKNIKA MJ 10/22 .... 19.00
CM-141 .... 19.00
BMC COLOR 16.00
VIDEO RECORDERS 13.00
(Dimensions Required)

Order by stating NAME and MODEL and COLOR CHOICE TAN or BROWN. Enclose check or money order plus $1.50 per item (4.50 max.) shipping and handling California Res. Include 6.5% Sales Tax.

SPECIAL COVERS WILL BE MADE TO YOUR DIMENSIONED SKETCH. SEND YOUR REQUIREMENTS FOR OUR LOW PRICE QUOTES

Crown Custom Covers
9606 SHELLYFIELD RD., Dept. A
DOWNEY, CA 90240
(213) 862-8391

FACTORY AUTHORIZED
COMMODORE
REPAIR CENTER
1-800-772-7289
IN ILLINOIS (312) 879-2888

C64 Repair (PCB only) . 39.95*
1541 Repair 79.95*
1541 Alignment only 29.95*
Power Supplies . 34.95
Commodore Parts . CALL

* Includes parts, labor & UPS return shipping. Air Freight add $10.00
Diagnosis fee of $25.00 for any unit altered or with no defects.
CALL BEFORE SHIPPING
VISA, MASTER or MONEY ORDER
SERIAL NUMBERS REQUIRED
24-48 HRS TURN AROUND
(Subject to Parts Availability)

TEKTONICS PLUS, INC.
150 HOUSTON ST.—STE. 308
BATAVIA, IL 60510

CLIP AND SAVE

TurboDisk 64

Don Lewis

This program is so powerful and valuable that we're republishing it here for those who might not have seen it in the July 1985 issue. Impossible as it seems, "TurboDisk 64" speeds up the 1541 disk drive's loading time 300 percent or more—in fact, the longer the program, the more the gain. Also in this issue, you'll find several programs which expand the power of TurboDisk: "TurboDisk Relocator" and "Turbo Boot Maker."

If you've ever used a really fast disk drive, you know that the Commodore 1541 drive leaves something to be desired—namely, speed. True, it's much faster than a Datassette, but it's still annoyingly slow compared to other floppy disk drives with high-speed parallel interfaces. Now there's a solution: "TurboDisk 64."

Once you start using TurboDisk, you'll wonder how you got along without it. TurboDisk turbocharges the loading process by a factor of three times or more. In fact, the longer the program, the more improvement you'll see.

TurboDisk requires no modifications to your disk drive or computer. It loads programs saved in the usual manner; no special Turbosave is required. It works with most BASIC and machine language programs, including the DOS Wedge. It does not compromise reliability. And you can switch it on or off at any time by typing a single command.

If you're still skeptical, give TurboDisk a try—it delivers what it promises. If you already have a copy of TurboDisk from the July 1985 issue of the GAZETTE, or from that month's GAZETTE DISK, then you don't need to enter this program. This is *not* an updated version of TurboDisk; it's a reprint for those readers who may have missed it the first time around.

Preparing TurboDisk

Since TurboDisk is written entirely in machine language, it must be entered with the "MLX" machine language entry program, found elsewhere in this issue. Be sure that you read and understand the instructions for using MLX before you begin entering the data for TurboDisk. When you first run MLX, you'll be asked for starting and ending addresses. The proper values for TurboDisk are as follows:

Starting address: C000
Ending address: C3BF

You may then begin entering the data for TurboDisk. If you want to save a bit of typing, you can skip lines C1B8–C1F8, since this filler area does not contain any useful information.

When you've finished entering the numbers, be sure to use the MLX Save option to make at least one copy of the TurboDisk data. You'll probably find TurboDisk so useful that you'll want a copy on every disk you use. You can use the MLX Save option repeatedly to make copies on different disks. If you want to put a copy of TurboDisk on a new disk at some later date, you can use any copy program or you can use MLX. To do this, load and run MLX, then enter the starting and ending addresses listed above. Insert a disk containing TurboDisk into the drive, then use MLX's Load option to load in the TurboDisk data. Next, insert the disk on which you wish to write TurboDisk and use MLX's Save option to store the new copy.

To load TurboDisk, use a command of the form LOAD "TURBODISK 64",8,1 (replace TURBODISK 64 with whatever filename you used when you stored the TurboDisk data). Next, type NEW and press RETURN to reset important memory pointers, then SYS 49152 to activate the program. The message TURBODISK ACTIVATED signals that you're ready for high-speed loading.

Turbocharged LOADs

Once TurboDisk is activated, no special commands are necessary. Just type LOAD "*filename*",8 or LOAD"*filename*",8,1 as usual. You'll be amazed at the difference.

One thing you'll notice immediately is that the red light on the disk drive doesn't come on at all during a Turboload. Don't panic; this is normal. It's also normal for the 64's screen to blank out as TurboDisk works. When the program is loaded, the screen reappears unaltered.

You may occasionally find it necessary to deactivate TurboDisk and use a normal LOAD instead. For example, 1541 disk drives are prone to head-alignment problems, so if you have a disk formatted on a drive other than your own, you may find that your drive has difficulty loading programs from it. Since the Turboload routine gives up more easily on difficult LOADs, you may have to switch to the more forgiving standard LOAD to get the program into your computer. You can switch off TurboDisk at any time without erasing it from memory by entering SYS 49155 (you should see the message TURBODISK DISABLED). To reactivate TurboDisk, enter SYS 49152.

You'll also find it necessary to use the SYS to reactivate TurboDisk after pressing RUN/STOP–RESTORE, which effectively disconnects TurboDisk.

TurboDisk resides in the 4K block of free memory starting at address 49152 (hex $C000), so it's completely safe from BASIC. However, many other machine language programs or subroutines also use this memory space and may overwrite TurboDisk. Don't attempt to use TurboDisk to load any program which occupies locations 49152–50431 ($C000–$C4FF). If the program you wish to Turboload uses this area of memory, you can use "TurboDisk Relocator," found elsewhere in this issue.

TurboDisk speeds up LOADs, but it can't speed up SAVEs or VERIFYs. It also doesn't affect the speed of disk file handling with OPEN, PRINT#, GET#, and so forth. It's not compatible with certain features of some programs, such as loading text files with *SpeedScript*, although you can use TurboDisk to load *SpeedScript* in the first place. It also may not work with some commercial software.

How TurboDisk Works

The machine language for TurboDisk is unusual in that only half of it works within your computer—the rest is actually executed within the 1541 drive itself. Commodore disk drives are *intelligent* units, containing their own microprocessors, RAM, and ROM. This means that they can be programmed for special effects, like turboloading.

During the brief delay you notice between the time you enter the LOAD command with TurboDisk and the time the drive starts spinning, 444 bytes of machine language are transferred from the computer to the drive's RAM. In the 64, it is stored in locations 49664–50107 ($C200–$C3BB). This required transfer of data before each Turboload adds a certain amount of overhead time, which explains why TurboDisk gives less speed improvement for short programs.

TurboDisk operates by changing the ILOAD vector at locations 816–817 ($330–$331) to point to itself, bypassing the normal LOAD routines in ROM. TurboDisk first checks to see whether a disk directory (LOAD "$",8) or a VERIFY was requested. In either of these cases, control is returned to the ROM routines for normal processing. If a program LOAD was requested, the routine adds the filename to the code for the disk drive portion, then transfers that data to the drive's memory.

The portion of TurboDisk in the disk drive uses routines in the drive's ROM to locate the desired program and read it from the disk sector by sector. To improve speed, routines like the one that turns on the red light are omitted, and only the essential ones are used. The 256 bytes of data from each disk sector are transferred two bits at time to a 256-byte buffer within the computer. In the 64, this buffer is at locations 50176–50431 ($C400–$C4FF).

TurboDisk machine language in the computer reads the incoming data from the serial port's DATA and CLK lines, instead of just the DATA line as in normal serial data transfers. Thus, TurboDisk temporarily converts your serial bus into a two-bit parallel bus. When the entire 256 bytes from a disk sector have been transferred into the computer's buffer, data from the buffer is added to the program in memory while the drive is reading the next sector from the disk.

Just How Fast Is It?

Despite a few limitations, TurboDisk is one of the most valuable general-purpose utilities a disk user can own. To discover exactly how fast it is, we ran some tests. The results, below, demonstrate how TurboDisk yields the most improvement with medium to long programs. (Results with different disk drives may vary.)

	Blocks	Normal LOAD	Turboload	Factor
Program 1	31	21 sec	7 sec	3.0
Program 2	17	13 sec	5 sec	2.6
Program 3	45	31 sec	9 sec	3.4
Program 4	8	7 sec	5 sec	1.4
Program 5	25	18 sec	6 sec	3.0
Program 6	122	75 sec	17 sec	4.4

Special Note To 128 Owners

For those 128 owners who use a 1541 disk drive: When you're in 64 mode, you can load and run TurboDisk 64 as listed. For 128 mode (and a 1541), see "TurboDisk 128" elsewhere in this issue.

If you own a 1571 disk drive, you don't need a Turbo program while you're in 128 mode—the 128 and 1571 are capable of using the fast serial transfer hardware built into the disk drive and computer. The 128/1571 combination is twice as fast as TurboDisk at its best, and about eight times faster than the 1541 alone. The 1571 slows down to the 1541's sluggish pace when you're in 64 mode, however. To speed up the 1571/64 mode combination, you can use TurboDisk 64. But first you must tell the 1571 to act like a 1541 with the following line:

```
OPEN 15,8,15, "U0>M0": CLOSE 15
```

To go back to 1571 operations, change the second zero to a one ("U0>M1"). However, you must make a decision. You can use double-sided disks while the 128 is in 64 mode and the drive is in 1571 mode, but not while using TurboDisk 64. Or you can use TurboDisk to speed up the 1571 drive in 1541 mode, but then you cannot use both sides of a disk. It's up to you: fast operations limited to one side of the disk or slow loads and access to both sides of a disk.

See program listing on page 97.

Note to readers outside North America: High-speed TurboDisk data transfers rely on precise timing, so the program may fail to operate on systems that use the European PAL video system instead of the North American NTSC system. The reason is rather technical—64s with PAL video use a slightly different microprocessor clock frequency. To compensate for this, an Australian reader submitted a modification which appeared in the January 1986 "Bug-Swatter" column. If TurboDisk will not operate properly with your PAL video 64, try changing the following lines as shown:

```
C190:8D 00 DD A2 04 CA D0 FD AB
C198:EA A2 04 AD 00 DD 0A 08 29
```

TurboDisk Relocator

Dino Bavaro

"TurboDisk 64" becomes a more versatile and powerful utility when used with this short program. Now you can use TurboDisk 64 with most any machine language program. For the Commodore 64.

"TurboDisk 64" is an excellent utility program that radically speeds up the 1541 for load operations. Since TurboDisk may be activated in program mode, it can be incorporated quite easily with other programs. The only drawback is its location in memory—$C000 or 49152, quite a popular spot for other machine language programs. You may often find yourself forced to use a normal load because the program you want to turboload is at that same address.

Because of the numerous memory configurations available on the 64, many programs are written as *modules*. When the main program is executed, it in turn loads in other modules such as machine language routines, hi-res screens, and so on. All the modules required are loaded in only once when the program is first run. TurboDisk (in program mode) is also needed only once at the beginning of the module loading. By being able to relocate TurboDisk, we could put it in BASIC RAM (or wherever we want) and not worry about it being overwritten, because once the modules are loaded, we can deactivate it since it's no longer needed. Care, however, must be taken to relocate TurboDisk to an area of memory which does not conflict with the modules being loaded.

User's Choice

The program accompanying this article, "TurboDisk Relocator," allows you to select the area of memory for TurboDisk. The DATA statements in this program reflect the key memory locations that have to be altered whenever TurboDisk is relocated to a different area of memory. To use the program, just type it in and run it. The program prompts you for a new program name to be assigned to the new version. I find it helpful to append the program's starting address to the end of the program name. If you were creating a TurboDisk version to be executable at location 4096, you could name it "TBDISK.4096". This makes things easier, especially if you have other versions of TurboDisk that execute at different locations.

The program prompts you to enter the memory address of where to assemble the new version of TurboDisk. You should respond with a decimal address on a full-page boundary (that is, an even multiple of 256). It's advisable not to select memory areas under ROM or other key memory pages such as addresses below 2048.

Once the program knows the address of where to locate the new TurboDisk version and the new name, it proceeds to read the original version from disk and write a new version modified for the specified starting address back to the same disk. (Be sure the name you use for the new version is not already used by another file on the disk.)

To activate the new version, use a SYS statement to the new starting address you selected. For example, if you created a version of TurboDisk relocatable to address 32768, then you would start it with SYS 32768 (in either program or direct mode). To deactivate the new version, SYS to the address three bytes beyond the new starting address. For the example of starting at 32768, you could use SYS 32768 + 3 (or just SYS 32771). To incorporate TurboDisk into one of your programs which loads modules, you can use the following technique.

```
1 ON A GOTO 3,5,6
2 A=1:LOAD "TBDISK.32768",8,1: REM
   LOAD TBDISK VERSION 32768
3 SYS 32768: REM ACTIVATE
   TURBODISK
4 A=2:LOAD "HI-RES SCREEN",8,1
5 A=3:LOAD "ML-SORT",8,1
6 SYS 32768+3: REM DEACTIVATE
   TURBODISK
7 REM REST OF PROGRAM
```

See program listing on page 102.

Turbo BootMaker

Bert Rozenberg

This program makes "TurboDisk 64" even more useful. It creates a boot program that lets you load any program at turbo speed—without using TurboDisk. And after turboloading, it automatically runs. For the Commodore 64 and 1541 disk drive.

One of my favorite programs from COMPUTE!'s GAZETTE is "TurboDisk" for the Commodore 64. It greatly speeds up the loading time of the ordinarily slow 1541 disk drive. To enhance the use of this excellent utility, I wrote "Turbo BootMaker," which lets you autoboot your programs at turbo speed without loading TurboDisk.

Making The Boot

After typing in Turbo BootMaker, save a copy. To use it, load it and type RUN. (If you're using TurboDisk, be sure to *disable* it before you run Turbo BootMaker.) The screen prompts make the program very easy to use. First, insert your disk with a copy of TurboDisk. *(Ed. note: Turbo BootMaker works with any version of TurboDisk—July 1985* GAZETTE, *April 1985* COMPUTE!, *or "TurboDisk 64," elsewhere in this issue. It also works with versions created using "TurboDisk Relocator," also in this issue.)* You're asked to enter the TurboDisk filename (the name you used to save it on your disk). Be sure to use an appropriate version of TurboDisk. The normal version works for turbobooting BASIC programs and some machine language (ML) programs. However, it cannot be used to turboboot ML programs that load at its own address, 49152 ($C000 hexadecimal). To turbo boot an ML program that resides at 49152, you must use a version of TurboDisk that resides elsewhere in memory. The "TurboDisk Relocator" program elsewhere in this issue lets you create versions of TurboDisk that can work from other memory locations. After you enter the filename, there will be a short delay as the TurboDisk file is read into memory.

You're then asked to insert the disk on which you wish to create the turbobooter file. The next prompt asks for the filename of the program you want to turboboot. (If you press RETURN only at this prompt, the wildcard (*) character will be used as the filename.) If a copy of that program is not already present on the disk, you'll be reminded to add a copy after you finish creating the turbobooter. Turbo BootMaker does not alter the program to be turbobooted; instead, it creates a file that automatically loads TurboDisk, then turboloads the specified program and starts it running. A copy of the program to be turbobooted must be on the same disk as the turbobooter file. That copy can always be loaded and run normally independently of its associated turbobooter file.

You're asked if the program to be turbobooted is BASIC or ML (machine language). Press B or M. If it's ML, you're asked for the starting address, which can be entered in either decimal or hexadecimal (you must precede hex values with a $). For example, if the command to start the program is SYS 49152, you can answer the starting address prompt with either 49152 or $C000. You should note that many of the major machine language programs published in the GAZETTE are designed to be loaded and run as if they were BASIC. Such programs usually start at address 2049 ($0801); examples include *SpeedScript*, "SpeedCheck," and "Address Cataloger" (in this issue). For these programs you should select B (BASIC), not M (machine language), at this prompt. If you select M and specify 2049 or $0801 as the starting address, the program will crash after loading. As a rule, if you start a program with RUN, select option B; if you start it with a SYS, select option M.

Last, you're prompted to give a filename to the new turbobooting program (do not use the wildcard convention). It would be wise to use a filename which indicates that this is a turbobooter file, and which program it turboboots. For example, you might use the name SS.TBOOT for a file which turboboots *SpeedScript*. After you enter the filename, there will be another short delay as the turbobooter file is written to disk.

At this point, you've created a boot program that will automatically load the specified program at turbo speed every time you run it. It also runs the program after it's been loaded. You don't need to have TurboDisk on the same disk—all you have to do is LOAD *"filename"*,8,1 (be sure to include the ,1) where *filename* is the name of the turboboot file you created with the procedure described above.

There are a few things you should note about using the turbobooter file. First, the screen will appear to fill with garbage characters for a second or two after you enter the LOAD command. Don't panic; this is normal, and the screen is cleared when the turboload begins. Second, even though the turbobooting process usually is a good deal faster than a regular LOAD, it isn't quite as fast as turboloading directly with TurboDisk already in memory. This is because the turbobooter must load the TurboDisk machine language before it can turboload the program. However, you'll probably find that the convenience of having your programs start automatically outweighs the slight speed decrease. Finally, when turbobooting machine language programs like "MetaBASIC" that are designed to be used in conjunction with BASIC, you must remember to type NEW and press RETURN after the turboboot is finished so that important memory pointers will be reset.

See program listing on page 99. ■

TurboDisk 128

Don Lewis

Are you using a 1541 disk drive with your Commodore 128? Here's a powerful utility that can reduce the time you spend waiting for programs to load by 300 percent or more.

If you've upgraded to a Commodore 128 from a VIC-20 or 64 and are still using a 1541 disk drive, you're probably envious of those fellow 128 owners whose 1571 drives can load programs in the blink of an eye. Perhaps you've used "TurboDisk 64" in 64 mode and wished for an equivalent speedup for 128 mode. Here's the answer: "TurboDisk 128," a new and improved version specifically for the 128/1541 combination.

TurboDisk 128 works only in 128 mode; you'll still need to use TurboDisk 64 in 64 mode. And the program works only with a 1541; it isn't useful in conjunction with a 1571. If you own a 1571 disk drive, you don't need a Turbo program while you're in 128 mode: The 128 and 1571 can use the fast serial transfer hardware built into both disk drive and computer, which is as much as eight times faster than a standard 1541—about twice as fast as TurboDisk.

But even if TurboDisk 128 doesn't permanently cure your desire for a 1571, it will make your life with the 1541 more bearable. In fact, once you start using TurboDisk, you'll wonder how you got along without it. TurboDisk turbocharges the loading process by a factor of three times or more. In fact, the longer the program, the more improvement you'll see. Like TurboDisk 64, the 128 version requires no modifications to your disk drive or computer. It loads programs saved in the usual manner; no special Turbosave is required. It works with most BASIC and machine language programs. It does not compromise reliability. And you can switch it on or off at any time by typing a single command.

Typing It In

Since TurboDisk is written entirely in machine language, it must be entered with the new 128 version of our "MLX" machine language entry program, which makes its debut elsewhere in this issue. Be sure that you read and understand the instructions for using MLX before you begin entering the data for TurboDisk. When you first run MLX, you'll be asked for starting and ending addresses. The correct values are as follows:

Starting address: 1300
Ending address: 16CF

Now you may begin entering the data for TurboDisk. When you've finished entering the numbers, be sure to use the MLX Save option to make at least one copy of the TurboDisk data. You'll probably find TurboDisk so useful that you'll want a copy on every disk you use. You can use the MLX Save option repeatedly to make copies on different disks. If you want to put a copy of TurboDisk on a new disk at some later date, you can use any copy program or you can load an existing copy of TurboDisk, place the disk on which you wish to store the new copy of TurboDisk in the drive, and use a command of the form BSAVE *"filename"*,B0,P4864 TO P5839.

To load TurboDisk, use a command of the form BLOAD "TURBODISK 128":SYS DEC("1300") (replace TURBODISK 128 with whatever filename you used when you stored the TurboDisk data). The message C128 TURBODISK ENABLED signals that you're ready for high-speed loading.

Turbo LOADS

Once TurboDisk is activated, no special commands are necessary. Just type LOAD *"filename"*,8 or DLOAD *"filename"* or BLOAD*"filename"* as usual. You'll be amazed at the difference.

One thing you'll notice immediately is that the red light on the disk drive doesn't come on at all during a turboload. Don't panic; this is normal. It's also normal for the 40-column screen to blank while TurboDisk works. When the program is loaded, the screen reappears unaltered.

You may occasionally find it necessary to deactivate TurboDisk and use a normal LOAD instead. For example, 1541 disk drives are prone to head alignment problems, so if you have a disk formatted on a drive other than your own, you may find that your drive has difficulty loading programs from it. You can switch off TurboDisk at any time without erasing it from memory by entering SYS DEC("1303"), or the equivalent SYS 4867. You should see the message C128 TURBODISK DISABLED. To be safe, it would be wise to include a BANK 15 before the SYS to ensure that the system is in its normal BASIC configuration. To reactivate TurboDisk, enter SYS DEC("1300"), or the equivalent SYS 4864 (again, it would be wise to precede this with a BANK 15). You should see the message C128 TURBODISK ENABLED to indicate that turboloading is now available.

You'll also find it necessary to use the SYS to reactivate TurboDisk after pressing RUN/STOP–RESTORE, which effectively disconnects TurboDisk.

TurboDisk resides in the currently unused area of free memory starting at address 4864–5839 (hex $1300–$16CF), so it's completely safe from BASIC. However, this memory area is rapidly becoming popular with 128 machine language programmers and you may find other programs that use these locations. Such programs cannot be used with TurboDisk because loading them will overwrite the TurboDisk program. Turbodisk also uses the block of memory at 3072–3327 ($0C00–$0CFF) as a buffer for the data read from disk. This area is the RS-232 input buffer, but since the 128 can't turboload and receive RS-232 input simultaneously, this dual usage should cause no conflict. However, you should be aware that some programmers use the RS-232 buffers for machine language routines. Such routines cannot be used with TurboDisk.

TurboDisk speeds up LOAD, DLOAD, BLOAD, and the monitor's L command, but it can't speed up SAVE or VERIFY. It also doesn't affect the speed of disk file handling with PRINT#, GET#, and so forth. It's not compatible with certain features of some programs and may not work with some commercial software.

How It Works

The machine language for TurboDisk is unusual in that only half of it works within your computer—the rest is actually executed within the 1541 drive itself. Commodore disk drives are *intelligent* units, containing their own microprocessors, RAM, and ROM. This means that they can be programmed for special effects, like turboloading.

During the brief delay you notice between the time you enter the load command and the time the drive starts spinning, 464 bytes of machine language are transferred from the computer to the drive's RAM. In the 128, this data is stored in locations 5376–5839 ($1500–$16CF). This required transfer before each turboload adds a certain amount of overhead time, which explains why TurboDisk gives less speed improvement for short programs.

The 128-resident portion of TurboDisk operates by changing the ILOAD vector at locations 816–817 ($330–$331) to point to itself, bypassing the normal LOAD routines in ROM. TurboDisk first checks to see whether a disk directory or a verify operation was requested. In either of these cases, control is returned to the ROM routines for normal processing. If a program load was requested, the routine adds the filename to the code for the disk drive portion, then transfers that data to the drive's memory.

The portion of TurboDisk in the disk drive uses routines in the drive's ROM to locate the desired program and read it from the disk sector by sector. To improve speed, routines like the one that turns on the red light are omitted, and only the essential ones are used. The 256 bytes of data from each disk sector are to a 256-byte buffer within the computer. As mentioned above, this buffer is at locations 3072–3327 ($0C00–$0CFF). TurboDisk sends data over both the DATA and CLK lines on the serial port, instead of just the DATA line as in normal serial data transfers. Thus, TurboDisk temporarily converts your serial bus into a two-bit parallel bus. When the entire 256 bytes from a disk sector have been transferred into the computer's buffer, data from the buffer is added to the program in memory while the drive is reading the next sector from the disk.

The Longer, The Faster

Despite a few limitations, TurboDisk is one of the most valuable general-purpose utilities a disk user can own. To discover exactly how fast it is, we ran some tests. The results, below, demonstrate how TurboDisk yields the most improvement with medium to long programs. (Results with different disk drives may vary.)

	Blocks	Normal LOAD (seconds)	Turboload (seconds)	Factor
Program 1	7	7	3	2.33
Program 2	16	13	4	3.25
Program 3	28	20	6	3.33
Program 4	55	40	10	4.00
Program 5	138	94	25	3.76

Note to readers outside North America: High-speed TurboDisk data transfers rely on precise timing, so the program may fail to operate on systems that use the European PAL video system instead of the North American NTSC system. The reason is rather technical—128s with PAL video use a slightly different microprocessor clock frequency. An Australian reader submitted a modification to compensate for this in the Commodore 64 version. Since we do not have access to a 128 with PAL video for testing, we cannot guarantee that the same modification will work in the 128 version, but if TurboDisk 128 will not operate properly with your PAL video system you can try changing the following line:

```
1468:A2 04 CA D0 FD EA A2 04 2E
```

See program listing on page 97.

Boldface

Thomas Carlson

This seven-line program offers an added dimension—a boldface font—to your Commodore 1526 or MPS-802 printer. For the Commodore 128, 64, Plus/4, 16, and VIC-20.

The Commodore 1526 and MPS-802 printers offer very good print quality. They also offer the programmer precise control over the spacing of the printed lines. This spacing is easily changed with this single line:

```
OPEN 6,4,6:PRINT#6,CHR$(J):CLOSE 6
```

The value of J determines the line spacing. A value of 36 results in normal spacing on the MPS-802. (The printer divides an inch into 216 segments, so the usual spacing of six lines per inch translates to 36/216 spacing from the bottom of one character to the bottom of the next.) The smaller the value of J, the smaller the line spacing. A value of 0 results in no linefeed at all—the lines will overlap, printing one on top of another. By changing the spacing to a small value (1 or 2) and printing the same line twice, one can get very well-defined character print quality. The two lines overlap, but one is slightly lower (1/216 inch). This overlap allows the characters to be more fully formed and darker.

While this method is fine for one or two lines, it gets quite tedious with any more. "Boldface" automates this process. It takes any sequential text file and prints it out with this improved character quality.

Boldface is very easy to use; just type it in and RUN it. Type in the name of your sequential file when prompted. Be certain that your printer is turned on before pressing RETURN. To print a sequential file from tape instead of disk, you'll need to change line 20 to

```
OPEN 4,4,7: OPEN 6,4,6: OPEN 8,1,0,FF$
```

Converting To Sequential Files

If you want to print program listings in bold, you'll first have to convert the listing to a sequential file. You can do this using

```
OPEN 8,8,8, "0:filename,S,W": CMD
  8,"title": LIST
```

for disk (be sure you have a formatted disk in the drive before entering the command), or

```
OPEN 8,1,1, "filename": CMD 8,"title":
  LIST
```

for tape. After the cursor reappears, type the following:

```
PRINT#8: CLOSE 8
```

and press RETURN. If you were writing to disk, the drive should stop spinning and the busy light should go out. Your listing is now a sequential file—with the filename you chose—ready to be printed out with Boldface.

Many word processors, like *Easy Script*, automatically format text into sequential files. Some other word processors, like *SpeedScript* and *WordPro*, create program files containing screen codes instead of character codes. But it's not difficult to convert these. *WordPro*, for example, has a way to save the file to disk in ASCII format (see your manual).

In *SpeedScript* 3.0 and higher, you can load a document and then press SHIFT–CTRL–P. Answer the *Print to:* prompt with D for disk (*SpeedScript* cannot print to tape), then type in a filename for the text. Your text will be written to a sequential (SEQ) disk file as character codes. Version 1 or 2 of *SpeedScript* does not allow printing to the disk, so you'll have to use the file converter program from the "*SpeedScript* Revisited" article in the May 1984 issue of COMPUTE!'s GAZETTE.

Modifications For 1526

Because the earlier 1526s used slightly different spacings from the later models of the 1526 (and the MPS-802), some modifications may be needed. The first thing to check is the print quality. In line 50, the number following the first CHR$ (currently 1) determines this. Create a short test file and print it out several times using Boldface, each time using a different number in line 50 (between 0 and 4 is an acceptable range). Keep whichever number gives the best quality. Now the spacing between lines must be adjusted. The number following the second CHR$ in line 50 (currently 17) determines this. Print your test file and see how closely it matches the spacing your printer normally uses. If the spacing with Boldface is too wide, then decrease the value of 17 in line 50. If it's too narrow, then increase the value of 17. Then make another test printout and continue changing the value in line 50 until the spacing with Boldface is the same as your printer usually prints. When you achieve the results you want, your version of Boldface should be saved to disk or tape. It's now ready to use.

See program listing on page 101.

KeyDef

A. F. Shephard

With this short utility for the Commodore 128, you can redefine any—or all—of the keys to print whichever character you choose.

The Commodore 128 is a highly versatile and powerful machine—windows, high- resolution graphics, 40- or 80-column displays, redefinable function keys, and more. But it suffers from a few shortcomings. For example, the numeric keypad is almost useless for DATA statements because there is no comma, unless you use the KEY statement to redefine one of the function keys. Wouldn't it make more sense to change the period to a comma? Unfortunately, KEY acts only on the function keys. But "KeyDef" lets you redefine any key on the keyboard, and gives you access to six completely different keyboards.

Scanning For A Code

To understand how this is possible, you need to understand how the 128 determines which character to display when a key is pressed. Here's a short synopsis: The computer interrupts its normal operations 60 times per second to perform housekeeping chores. One of these chores is checking to see whether a key is pressed. This process, called the *keyscan,* involves checking each key in sequence to see if it is pressed. The 88 keys are arranged electrically in a matrix as eight rows of 11 columns. Each key has a *keycode* that reflects the key's position within the matrix. Only one keycode is returned per keyscan; if more than one key is pressed, the value returned will be that for the key with the higher keycode. Keycodes range from 0–87; if no key is pressed, the keyscan routine returns the value 88. You can find the keycode for most keys by running this one-line program:

```
10 PRINT PEEK(213): GOTO 10
```

Following is a complete list of keycodes.

If you're familiar with the 128's character (ASCII) codes, it will be obvious that the keycodes don't have any direct relationship to the character codes for the corresponding letters and numbers on the faces of the keys, so you may be wondering how the 128 translates the keycode into a character code. Note that none of the shift keys (SHIFT, Commodore, CONTROL, ALT, or CAPS LOCK) appears in the keycode table. Instead, the keyscan routine checks these keys to select one of six translation tables. The keycode is then used as an index to the table to find the equivalent character code for the key being pressed. For example, suppose SHIFT-N is pressed; the keyscan routine will select the SHIFT translation table and read the 39th value in the table as the value for SHIFT-N (the keycode for N is 39).

To determine the addresses of the translation tables, the 128 maintains a set of six *pointers* in memory. (A pointer consists of two consecutive memory locations that together hold an address in the standard low-byte/high-byte format.) The pointers to the keyboard translation tables are found on page 3 of the 128's memory:

830-831 ($033E-033F) standard (unshifted)
832-833 ($0340-0341) SHIFT
834-835 ($0342-0343) Commodore
836-837 ($0344-0345) CTRL
838-839 ($0346-0347) ALT
840-841 ($0348-0349) CAPS LOCK

On powerup or reset, these locations are initialized to point to tables in ROM. The pointers can be changed to point to customized tables in RAM, however, and that's just what KeyDef does. It copies the usual values from the ROM tables down to a free area of RAM memory and then changes the pointers to point to the new tables in RAM. By POKEing new ASCII codes into the relocated tables, the keyboard can be redefined.

Each of the translation tables contains 89 bytes; the first 88 bytes in the table each correspond to one keycode, while the last byte is the value returned if no key is pressed. There are actually only five different tables in ROM. The ALT-key pointer starts out with exactly the same value as the unshifted-key pointer, which explains why ALT doesn't seem to do anything. However, KeyDef sets up a separate table for ALT, so it can now have definitions completely independent of the unshifted key definitions.

Commodore 128 Keycodes

Key	Keycode	Key	Keycode
←	57	1	56
2	59	3	8
4	11	5	16
6	19	7	24
8	27	9	32
0	35	+	40
−	43	£	48
CLR/HOME	51	INST/DEL	0
Q	62	W	9
E	14	R	17
T	22	Y	25
U	30	I	33
O	38	P	41
@	46	*	49
↑	54	RUN/STOP	63
A	10	S	13
D	18	F	21
G	26	H	29
J	34	K	37
L	42	:	45
;	50	=	53
RETURN	1	Z	12
X	23	C	20
V	31	B	28
N	39	M	36
,	47	.	44
/	55	CRSR up/down	7
CRSR left/right	2	Space	60
F1	4	F3	5
F5	6	F7	3
ESC	72	TAB	67
HELP	64	LINE FEED	75
NO SCROLL	87	Cursor ↑	83
Cursor ↓	84	Cursor ←	85
Cursor →	86		

Numeric keypad:

0	81	1	71
2	68	3	79
4	69	5	66
6	77	7	70
8	65	9	78
+	73	−	74
.	82	ENTER	76

Using The Program

KeyDef is written entirely in BASIC so there are no special instructions for typing it in. Just remember to save a copy before running it.

After a brief pause, during which the key definitions are copied from the translation tables in ROM down to a free area of RAM memory, KeyDef prompts you to enter the key you wish to redefine. Press the appropriate key. Next, you're asked for the table in you wish to redefine the key (unshifted, SHIFT, Commodore, CTRL, ALT, or CAPS LOCK). You are then told the current ASCII (character) code value of the key in the selected table. Finally, you're prompted to enter the new character code for the key. If you're unfamiliar with Commodore's character codes, look in Appendix E of the *System Guide*. Unfortunately, this table was copied verbatim from the 64 *User's Guide*, and some of the character codes between 0 and 32 are incorrect. For a more accurate list of these codes, see Appendix I. CTRL-G (code 7), for example, produces a bell tone. It's listed in Appendix I, but not in Appendix E.

There are some tricky keys we need to mention. One is NO SCROLL—you must press it twice for KeyDef to recognize it when it asks Which Key? After that, it functions as you want it to. Also, the current function key definitions are stored and erased at the beginning of KeyDef, then restored at the end. Thus, to keep your function keys definitions intact, do not quit KeyDef with RUN/STOP-RESTORE. HELP and SHIFT-RUN/STOP are normally character codes 132 and 131, respectively. These can also be moved around the keyboard. RUN/STOP is odd. Press SHIFT with it if you want to redefine it. Notice that the numeric keypad numbers are different from those on the top of the keyboard, even though normally they act the same. The set of cursor keys at the top of the keyboard also has different keycodes from the pair at the bottom, so the two sets can be independently redefined.

If you need to recopy the standard keyboard definitions to set things back to normal after KeyDef is first run, exit the program and type RUN 20. Should you wish to save a set of definitions, the procedure is easy. Just enter the following commands:

```
BSAVE "filename1",B0,P5888 TO P6422
BSAVE "filename2",B0,P830 TO P842
```

These redefinitions can be reloaded with these commands:

```
BLOAD "filename1"
BLOAD "filename2"
```

The KeyDef program doesn't need to be present in memory once you've used it to make the new definitions. The tables that are BLOADed are sufficient to redefine the keyboard. The computer automatically handles the keyscanning and character translation. However, you must take some care when changing the pointers to the translation tables. Before you change the pointers, the addresses to which you redirect the pointers must contain valid translation tables (which is why you must BLOAD the tables before you BLOAD the vector values). Otherwise, you won't be able to type on the keyboard because the computer will not be able to interpret your keypresses. In fact, you can't even use RUN/STOP–RESTORE if the RUN/STOP key isn't defined; your only recourse will be the reset switch.

The area of memory set aside for the new translation tables is $1700–$1915 (5888–6421)—534 bytes total for the six 89-byte tables. According to the memory map in the *System Guide*, this is part of the area reserved for function key software. Basically, it doesn't get used by BASIC, so it's a perfect place for data like this. (Other machine language routines may use this area, however, so you should be on the lookout for conflicts. "TurboDisk 128" also resides in part of this reserved area, but it uses addresses lower than KeyDef, so the two programs can safely be used together.)

It should be noted that KeyDef changes only the keyboard behavior; the way the computer runs is unaltered. The letters on the screen keep their usual shapes; this is not a program to create custom characters. Also, if you change the letter *T* to be a *Z*, you've banished *T* from the keyboard but not from the computer. It can still print a *T* if you type ? CHR$(84)—the ASCII codes for the characters remain the same.

A Few Suggestions

The first thing you might want to do with KeyDef is to correct a minor but annoying bug. The CAPS LOCK key on the top row works like the SHIFT LOCK key for all alphabetic keys except for the letter Q, which still prints its unshifted form. This is sometimes called the *caps-lock-q bug*, and the reason it occurs is very simple—whoever at Commodore prepared the CAPS LOCK key translation table put the wrong character code value in the keycode position for Q. KeyDef allows you to fix this bug. Just replace the value for Q in the CAPS LOCK table with the proper value (209).

You may find the ESCape code sequences very useful when you're programming (see Appendix I in the System Guide for a complete list). ESC-A turns on automatic insert mode, ESC-I inserts a blank line, ESC-Q erases to the end of a line, and so on. But you have to reach up to the top left corner to reach the ESC key, which is somewhat awkward. If you defined the *0* on the numeric keypad as ESC (CHR$(27)) and the other keys on the keypad as *A*, *I*, *Q*, and so on, the escape sequences would be easier to type.

If you use a modem in telecommunications, you probably know that certain control characters are common (CTRL-C, CTRL-P, CTRL-S, and CTRL-Q are a few of the important ones). You need two hands to type these keys, which is somewhat inconvenient. If you predefined some keys to print the control characters, it would simplify things a bit.

Another good use, mentioned above, is redefining the period on the numeric keypad to be a comma. This is helpful when you have to type in a lot of DATA statements. To make typing in DATA statements even easier, turn on automatic line numbering with the AUTO command, and use the KEY statement to change one of the function keys to print DATA.

One final suggestion: The Apple IIc has a small toggle switch above the keyboard for changing the usual keyboard layout, which is most often called the *QWERTY keyboard*, to a *Dvorak keyboard*. The woman who holds the title as the world's fastest typist prefers the Dvorak keyboard because you can type faster. If you'd like to experiment, you could redefine the CAPS LOCK translation table in the Dvorak layout and press CAPS LOCK to switch between the two.

See program listing on page 101.

WCCA PRESENTS

THE COMMODORE SHOW

SEPTEMBER 20 & 21 1986
SHOW TIMES 10AM—6PM
LOS ANGELES AIRPORT HILTON
CALL 213-410-4000 for hotel reservations

- *EXHIBITS, EVENTS, AND DOOR PRIZES*
- *NATIONAL COMMODORE SPEAKERS*
- *SHOW SPECIALS & DISCOUNTS*
- *SEE THE LATEST INNOVATIONS IN HARDWARE/SOFTWARE TECHNOLOGY FOR THE COMMODORE MARKET*

The only West Coast exhibition and conference focusing exclusively on the AMIGA Commodore 128 PC and C-65 marketplace

REGISTRATION FEES: ONE DAY $10.00 TWO DAYS $15.00

FOR MORE INFORMATION AND DETAILS CONTACT:
WEST COAST COMMODORE ASSOCIATION, INC.
P.O. BOX 210638
SAN FRANCISCO, CALIFORNIA 94121
(415)982-1040 BETWEEN 8AM-5PM PST

$5 TALKING DISK

OVER 100 WORDS in vocabularies that you can put into your own programs! No extra hardware required. Sample programs include:

- Talking four-function calculator — choose English, Spanish, or German.
- Talking keyboard — letters and punctuation in English.
- Demonstration of voice editing.

The $5 Talking Disk is available for Commodore 64, 128, Atari 800, 800XL, 130XE, and Apple II+ (64K), IIe, and IIc.

If you want to make your own vocabularies, in any language or accent, then you must have a VOICE MASTER for processing speech input. VOICE MASTER lets you do much more: YOU CAN RECOGNIZE SPOKEN COMMANDS and WRITE MUSIC AS YOU HUM! And affordable too — under $90 including the headset and microphone.

Send $5 for the talking disk. Prepaid orders only. Includes postage. ($7 outside USA, Canada, and Mexico.) Information on VOICE MASTER will accompany your disk. Or you can call or write for VOICE MASTER information separately. Please specify computer make and model with your order.

COVOX INC.
675 Conger St., Dept. IN
Eugene, OR 97402
Telephone (503) 342-1271

128 Sprite Rotator

Mike Tranchemontagne

Here's a clever technique for rotating sprites as they are moved on screen. Demonstration programs are included.

The Commodore 128 *System Guide* that comes with the computer does a pretty good job of describing the basics of using sprites. The built-in sprite editor is easy to use, and saving and loading sprites is a snap. Moving sprites and detecting collisions can be fully automatic for realistic animation—without resorting to machine language, PEEKs, or POKEs. About the only thing you can't do is rotate a sprite. But why would you want to any way?

Let's say you'd like to write a program that displays a race car, viewed from above. The race car will be a sprite that you can easily create with the built-in sprite editor. It will be driven around the screen by a joystick, using the JOY function to read the joystick and the MOVSPR command to move the sprite—a simple program that does a lot in just a few lines. But what happens when you change direction? The race car just slides around the screen, always pointing in the same direction. Not very realistic. The SPRSAV command is the answer: It can *instantly* change the sprite to a different shape. The sprite shape can come from another sprite, a string variable or a string array. Thus, you can predefine a virtually unlimited number of sprite shapes for lightning quick recall and display.

A Demonstration

For an example of this, type in Programs 1 and 2. Program 1 is a simple BASIC program that chooses one of eight different sprite shapes depending on which of the eight possible joystick directions is selected. Each of the eight sprite shapes represents a dragster facing in one of the joystick directions. Program 2 isn't really a program—it's the shape definition data for the eight dragster sprites. The data must be entered with the 128 "MLX" machine language entry program found elsewhere in this issue. Be sure you read and understand the MLX article before you begin entering the sprite data. When you run MLX, you'll be asked for a starting address and an ending address. The values for the sprite data are as follows:

Starting address: 0E00
Ending address: 0FFF

After you've entered all of the sprite data, be sure to use the MLX Save option to save the data to disk with the filename DRAGSTER.SPR. You must use this name so that Program 1 can find the file (see line 50 of Program 1). Now load and run Program 1 and see what how much more realism you can achieve with sprite rotation.

Lines 10–40 of Program 1 initialize the graphics display. Line 50 loads the file created by Program 1. The BLOAD command, as used for sprite shape disk files, loads data into the 128 memory area reserved for the eight sprites. In BASIC 7.0, the sprites always get their shape data from this memory—one shape per sprite. If BLOAD were the only way to change a sprite's shape, changing sprite shapes would be a slow process. Instead, line 90 DIMensions a string array to hold eight sprite shapes, and line 100 uses the SPRSAV command (a truly versatile command) to define the string array contents—the eight different views of our race car. (The commands in line 50, 90, and 100 could be repeated with other sprite shape data files and other string arrays to define as many sprite shapes as needed—limited only by the amount of memory in bank 1 available for strings.) Line 110 and 120 turn on and position the car to about center screen. Lines 130 thru 140 form a loop which repeats until the fire button is pressed. The inner loop (lines 140 to 180) executes only when the joystick is moved off center. The joystick direction (JS$) is used to select the sprite shape (line 160) and one of the eight movement subroutines (line 170).

Program 3, "Sprite Rotator," rotates *any* sprite shape for you. All you have to do is define the first sprite shape and Sprite Rotator does the rest. Although you don't need to know how Sprite Rotator works to use it, you may find some of the following techniques useful. The 90-degree and 45-degree rotate subroutines (lines 410 and 500) are greatly simplified by the use of the graphics screen as a scratch pad memory. In line 580, GSHAPE stamps the image of the sprite shape to be rotated. Thus the RDOT(2) function (line 450 or 540) can address the sprite shape data in simple x,y coordinates. (These two lines were *much* more complicated when the rotation computations were performed on direct memory addresses.) The DRAW commands create the rotated shape below the original and the SSHAPE command at line 620 saves it to S$. After all eight shapes are ready, the subroutine at line 680 will display the BSAVE command for you—edit the filename and press RETURN to save your work. You can also use SPRDEF (the built-in sprite editor) to touch up any of the sprites before saving.

See program listings on page 102.

Kaleidoscope Revisited

W. M. Shockley

Here's an updated version of a popular 1985 Gazette program that turns your computer into an ever-changing kaleidoscope of shape and color—all under your control. This newer version adds sound, several more controls, and an option to get a printout on any Commodore or Commodore-compatible printer. For the 64, Plus/4, 16, and VIC.

The October 1985 issue of COMPUTE's GAZETTE included an interesting graphics program titled "Kaleidoscope." It turned the 64, Plus/4, 16, and VIC into a highly entertaining and colorful kaleidoscope with various speed and complexity controls. "Kaleidoscope Revisited" adds sound, a few more controls, and a printer option, but you don't need the original "Kaleidoscope" to use it. The original program has been incorporated into this updated version.

Getting Started

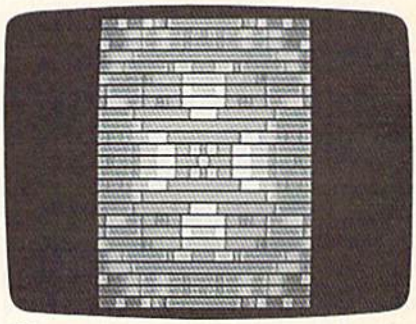
After typing in the version for your computer, save a copy. To use it, load it and type RUN. You're presented with a self-explanatory instruction screen which lists all the available functions and the corresponding keys. At this point, press any key to get started. The H (for Help) key can be pressed at any time during the program to get back to the help screen.

Kaleidoscope makes ideal patterns for quilt squares, paper snowflakes, or artistic designs. The new printer option allows you to save them. Also added to the original program is an option to select the character you want to comprise the pattern. Press P and you'll be prompted for an input. Type the screen code (1–255) of the character you want. (These codes are listed in the 64, Plus/4, and VIC user manuals.) A random character is chosen if you press R. Repeated R's make fascinating patterns.

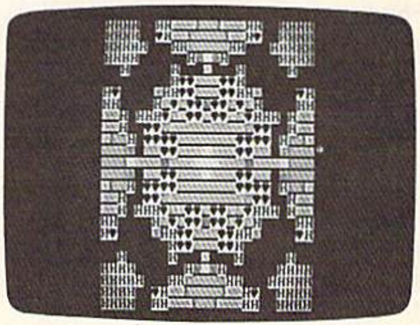
Printing Options

The printout option is selected by pressing SHIFT-P for a small copy, or SHIFT-D for a copy double width and double length, making it four times as large. A printout can be made only of a black-and-white pattern (selected by pressing B). As written, the program works with the Commodore 1525, MPS-801, and MPS-803 printers. If you own a Commodore 1526 or MPS-802 printer, a few line changes are necessary. If you have a 64, delete lines 1090–1150. Plus/4 and 16 users should delete lines 1050–1110, and VIC users should delete lines 950–1010. Then—regardless of which of the above computers you're using—add these lines to the program to adjust it for the 1526 or MPS-802:

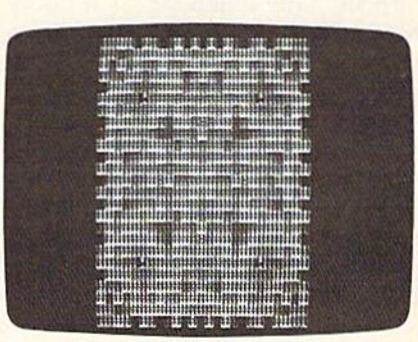
```
DK 1200 OPEN6,4,6:PRINT#6,CHR$
        (22):CLOSE6:OPEN4,4:FO
        RG=0TORR
HK 1210 IFFGTHENFORF=1TO2:PRIN
        T#4,CHR$(14);
FM 1220 FORN=SS+G*CCTOSS+G*CC+
        WW:Q=PEEK(N)
XQ 1230 IF(QAND15)=1THENPRINT#
        4,"V";
AH 1240 IF(QAND15)<>1THENPRINT
        #4," ";
JD 1250 NEXTN:PRINT#4:IFFGTHEN
        NEXTF
PB 1260 NEXTG:FORN=1TO4:PRINT#
        4:NEXT:CLOSE4:OPEN10,4
        ,10:PRINT#10:CLOSE10
BJ 1270 FG=0:RETURN
```



This pattern was created simply by running the program. None of the extra features are in effect.



The "H" and spade graphics character were selected with a new program option—choosing the characters you want to make the pattern.



A more complex pattern is selected with the function keys.

The S key toggles on and off the sound option. The remainder of the options are those found in the original "Kaleidoscope"—and are obvious from the help screen. The additions make an already interesting program even more flexible and entertaining.

See program listings on page 103.

BASIC Line Extender

Jay A. Reeve

This short but powerful utility gracefully removes Commodore's "two screen lines only" programming restriction. Included are versions for the Commodore 64, Plus/4, and 16.

How often have you hit the two-line squeeze while programming? Your BASIC statement won't quite fit into what's left of the two lines allowed by the Commodore screen editor. You go back and change full keywords to abbreviations—it still doesn't fit. You could simply move the last statement to the next line, except that it follows an IF-THEN statement.

Next, you replace the statement with GOTO and guess at a line number that you hope won't be in the way later on. Then you retype the statement on the new line (how did that go again?) and try to recall the logic you were using for the program. You're left with a feeling that your program has just lost a little of its elegance.

Ending The Squeeze

"BASIC Line Extender" is a utility for BASIC programmers that allows you to add to the end of any line in your program. You're still limited to entering two screen lines at a time, but you can build up program lines which take six or more screen lines to list. Once entered, these extended lines will save, load, list, and run properly whether or not BASIC Line Extender is active.

Although BASIC Line Extender can be used to extend any program line, it's most valuable for continuing IF-THEN statements, allowing you to handle an error, for instance, on the same line in which it is detected. It's also good for adding descriptive REM statements to program lines, and for creating extra-long DATA lines or ON-GOTO statements. When memory is at a premium, an extension saves at least four bytes over starting a new line.

Preparing BASIC Line Extender

The program itself is short and contains some machine language in the form of DATA statements. Type it in and be sure to save a copy before running it—the program will erase itself after creating and activating the machine language routine.

In the Commodore 64 version, line 10 protects a space for the machine language program by lowering the pointer to the top of BASIC by 256 bytes. If you'd like to locate BASIC Line Extender elsewhere in memory, replace the value for the variable AD in line 10 with the starting address you want.

To disable BASIC Line Extender: **POKE772,124:POKE773,165**.

Creating Extensions

An extension is a line to be added to the end of a program line already in memory. Enter the extension with the *same line number* as the line to which it will be added. The first character after the line number will be one of three signal characters which never begin a normal BASIC line: a colon (:), a quote mark ("), or a British pound sign (£).

1. When the extension begins with a new statement, follow the line number with a colon. The colon will be included in the extended line as a statement divider. If you enter the line, 10 PRINT"THIS IS A LINE", it will list normally. Next enter the line, 10 :PRINT"AND ITS EXTENSION" and the listing will read, 10 PRINT"THIS IS A LINE":PRINT"AND ITS EXTENSION".

2. When the separation falls between quotes (in a PRINT statement or string definition), the original line must *not* have a closing quote mark. (BASIC does not require close-quotes at the end of a line anyway.) The extension line, however, must begin with a quote ("), which will be omitted from the extended line. Enter 20 PRINT "THIS IS A LINE followed by 20 " AND ITS EXTENSION" and the listing will show 20 PRINT"THIS IS A LINE AND ITS EXTENSION".

3. To continue in mid-statement, begin the extension line with the British pound character. This signal character, of course, will not be included in the program. Enter 15 A=A+B then 15 £*256 to get 15 A=A+B*256. A statement may be broken and continued at any point *except within a BASIC keyword*. (BASIC stores and uses keywords as single-byte tokens. Extensions are tokenized separately, so the tokenizing routine would have no opportunity to recognize a keyword that was partly in the original line and partly in the extension.) Watch carefully for split keywords, as they will appear correct in listings but will cause syntax errors or, worse, erroneous results when the program is run. Numbers and variable names may be broken: 25 SYS49 and 25 £152 will result in 25 SYS49152.

If you prefer to use a different signal character (other than £), try replacing the number 92—at the end of line 60 in the 64 version or near the beginning of line 220 in the Plus/4 and 16 version—with 170 (for +), 95 for (←), or 173 for (/).

You can, if you like, add extension after extension—the tokenized line may be up to 244 bytes long. If an extension would cause this limit to be exceeded, a STRING TOO LONG ERROR will be returned, leaving the line unchanged. The trade-off for this dramatic increase in flexibility is some difficulty in editing.

Editing Extended Lines

If you ever use abbreviations for BASIC keywords, you know that line listings sometimes run over onto a third line, and that run-over lines can be difficult to edit. The extra-long lines generated with BASIC Line Extender may be no easier to edit, but in most cases they'll be no more difficult either. List the extended line and re-enter it, two screen lines at a time, by using abbreviations to shrink the lines enough to insert the line number and the appropriate signal character, being careful to reassemble any split keywords before entering and making necessary changes as you go.

If you anticipate needing to edit extended lines, you may wish to enter them first as partial lines with different, very high line numbers (you can even include the signal characters, so long as a line of that number does not already exist), then combine them by changing the line numbers. To edit, you can list the partial lines, make any changes, and recombine them by again replacing the line numbers. When the program is completed, the partial lines can easily be deleted from the end.

You no longer need to count spaces, refer to lists of abbreviations, and retype statements that won't fit. Activate BASIC Line Extender at the start of each programming session and let your creative logic flow—and forget about the two-line squeeze.

See program listings on page 102.

All programs listed in this magazine are available on the GAZETTE Disk. See details elsewhere in this issue.

NEW
COPY-1541
C64
C128
1541
1571
SUPER FAST DISK COPY PROGRAM
- ★ USE 1 OR 2 DRIVES (1541's or 1570/1571's)
- ★ COPY TIME: FULL=2 Min., BAM=23 Secs.-2 Min.
- ★ WILL ALSO RUN IN 1570/1571 DRIVES!
- ★ AUTOMATIC FORMATTING DURING COPY
- ★ GREAT FOR MAKING FAST MULTIPLE COPIES
- ★ PACKED WITH GREAT FEATURES
- ★ ABSOLUTELY NO HARDWARE TO INSTALL
- ★ THE MOST RELIABLE FAST COPIER ON THE MARKET
- ★ DON'T BE FOOLED BY THE LOW PRICE

THIS ONE IS VASTLY SUPERIOR!
COPIES AS FAST AS 23 SEC.
$19.95

NEW
COPY-1571
C128
1571
SUPER FAST DISK COPY PROGRAM
- ★ USE 1 OR 2 DRIVES (1570/1571)
- ★ COPY TIME: FULL = 2 Min., BAM=23 Secs.-2 Min.
- ★ MAKES 1 AND 2 SIDED COPIES
- ★ AUTOMATIC FORMATTING DURING COPY
- ★ GREAT FOR MAKING FAST MULTIPLE COPIES
- ★ PACKED WITH GREAT FEATURES
- ★ ABSOLUTELY NO HARDWARE TO INSTALL
- ★ THE MOST RELIABLE FAST COPIER ON THE MARKET
- ★ A NECESSITY FOR ALL SERIOUS 1571 OWNERS

NEW & HOT! ORDER YOURS TODAY!
COPIES AS FAST AS 23 SEC.
$29.95

FAST-LOAD/SAVE
C64
C128
1541
1571
- ★ LOADS/SAVES PROGRAMS LIGHTNING FAST
- ★ NO MORE LONG DELAYS WAITING FOR YOUR PROGRAMS TO BE LOADED OR SAVED
- ★ LOADS/SAVES UP TO 5-10 TIMES FASTER

$19.95

ESSENTIALS
C64
C128
1541
1571
- ★ RENUMBER ★ AUTOBOOT ★ DE-NEW
- ★ DATAMAKER ★ UNSCRATCH
- ★ FILE LOCK ★ APPENDER
- ★ FILE COPY (incl.rel)
- ★ SCREEN DUMP

$15.95

POWERHOUSE
C64
C128
1541
1571
- ★ **SPEEDFORMAT** (TRKS 1-40)
  FORMAT FULL/HALF TRK, PARTIAL/FULL DISK
  WRITES PROPER BLOCKS W/BAM & DIRECTORY
  9 Secs./18 Secs. W/VERIFY
  FORMAT MULTIPLE DISKS
- ★ **DISKMON**
  R/W TRACK, SECTORS, HEADERS
  CREATE YOUR OWN HEADERS & HIDDEN ID'S
  EDIT ML PROGRAMS RIGHT ON DISK
- ★ **DRIVEMON**
  R/W DRIVE MEMORY IN HEX OR
  DECIMAL SCREEN/PRINTER OUTPUT

$29.95

10% DISCOUNT ON 2 OR MORE FROM THIS AD

TO ORDER
1-813-792-5300
CREDIT CARD
NOT CHARGED
UNTIL WE SHIP

★ FAST SHIPMENT
★ FAST UPS DELIVERY

PAYMENT/SHIPPING:

	MC VISA	Pers. Check	Cert Check Drawn on US Bank	Money Order US Dollars	COD Add	Shipping & Handling Add
USA (48 states)	YES	YES	YES	YES	$3.00	$2.50
AK,HI,APO,FPO	YES	NO	YES	YES	NO	$5.50
Canada,Mexico	YES	NO	YES	YES	NO	$7.50
Foreign	YES	NO	YES	NO	NO	$9.50

Florida Residents add 5% Sales Tax. Personal & Co. checks allow 2 weeks. MasterCard/Visa orders require Card No./Exp. Date

POWERSOFT
INCORPORATED • P.O. BOX 7333 • BRADENTON, FL 33507

Save Your Copies of COMPUTE!

Protect your back issues of *COMPUTE!* in durable binders or library cases. Each binder or case is custom-made in flag-blue binding with embossed white lettering. Each holds a year of *COMPUTE!*. Order several and keep your issues of *COMPUTE!* neatly organized for quick reference. (These binders make great gifts, too!)

Cases:
$6.95 each;
3 for $20.00;
6 for $36.00

Binders
$8.50 each;
3 for $24.75;
6 for $48.00

(Please add $2.50 per unit for orders outside the U.S.)

Send in your prepaid order with the attached coupon

Mail to: Jesse Jones Industries, P.O. Box 5120,
Dept. Code COTE, Philadelphia, PA 19141

Please send me ________ COMPUTE! ☐ cases ☐ binders.
Enclosed is my check or money order for $ ______. (U.S. funds only.)
Name ______________________________
Address ______________________________
City ______________________________
State ______________________ Zip __________
Satisfaction guaranteed or money refunded.
Please allow 4–6 weeks for delivery.

simple answers to common questions

Tom R. Halfhill, Staff Editor

Each month, COMPUTE!'s GAZETTE *tackles some questions commonly asked by Commodore users. If you have a question you'd like to see answered here, send it to this column, c/o* COMPUTE!'s GAZETTE, *P.O. Box 5406, Greensboro, NC 27403.*

Q. Phones have it, clocks have it, radios have it, auto-dialers have it, and newer cars have it. But personal computers don't have it—and they need it more than the rest. Why haven't manufacturers incorporated or made available backup power supplies to safeguard against memory loss?

A. There are battery-backup power packs available for some computers, mainly the IBM PC. But they tend to be expensive and are designed to work only for short periods. The idea is to give you enough time to save your program before powering down, not to continue operating on batteries indefinitely.

The problem is that regular memory chips consume much more power than most batteries can deliver for an extended period of time. All of the other battery-backup devices you mention consume very little power. There's no way you could power a typical personal computer on a handful of penlight or flashlight batteries.

Portable laptop computers, such as the TRS-80 Model 100, get around this problem by using special memory chips called CMOS (Complementary Metal Oxide Semiconductor) chips. CMOS chips consume much less power than regular chips, but also cost a lot more. Your Commodore 64 or 128 might be two or three times more expensive if it were built with CMOS technology. And even with CMOS memory, a laptop such as the Model 100 cannot run for more than a day or so on a set of batteries. This makes it considerably more expensive to operate than a conventionally powered computer.

If CMOS chips become cheaper, they may find their way into more desktop computers. Until then, the best way to avoid power-outage anxiety is to save your data often and keep plenty of backups.

Q. In the March 1986 "Simple Answers To Common Questions" a reader asked why a piece of disk-based commercial software would load on a Commodore 64 system at the store but not at home on his own system. You suggested that perhaps his disk drive was misaligned. I have encountered this frustrating problem more than once, and it was caused by having a printer plugged into the disk drive and left turned off. Either turning the printer on or unplugging it solved the problem. I've found that *Movie Maker, Cell Defense,* and some older versions of *SpeedScript* won't load properly if the printer is plugged in and turned off.

A. We still suspect that drive misalignment is the most likely source of the reader's difficulties with commercial software, but a few other users may encounter the situation you suggest. The printer interfaces used to connect most third-party printers draw power from either the cassette port or a joystick port. Such interfaces remain on and may cause problems by attempting to respond to commands on the serial bus when the printer is off (even if the command is intended for the disk drive). This is more likely with commercial products which reprogram the disk drive for faster loading and/or for copy-protection purposes; *SpeedScript* does not reprogram the disk drive and is not copy-protected, so we don't know why it should cause problems. Still, if this simple solution works, it is worth the try.

Q. I have often seen programs with DATA statements strung together, and would like to know how the computer knows which DATA statements go with which READ statements.

A. Very simple. The first READ statement in a program begins fetching data from the first DATA statement in the program. It continues reading from the DATA statements in sequence until it has fetched all the data it needs, or until there are no more DATA statements. (In the latter case, the program stops with an OUT OF DATA error.) Here's an example:

```
10 FOR N=1 TO 5:READ A:NEXT
20 FOR N=1 TO 4:READ A:NEXT
30 DATA 1,2,3,4
40 DATA 5,6,7,8,9
```

Line 10 contains the program's first READ statement, so it begins reading from the program's first DATA statement at line 30. Line 10 loops five times, reading all four items of DATA in line 30, then continues to line 40 and reads the first data item there. Line 20 contains another READ statement, and it starts reading where the previous READ left off. In this case, it begins with the second item in the DATA statement at line 40. It loops four times, reading the rest of the data in line 40. Just remember that a program can safely read *fewer* data items than are contained in DATA statements, but cannot try to read *more* data items without causing an OUT OF DATA error.

If you want your program to start reading from the first DATA statement again, use a RESTORE statement. The next READ after a RESTORE acts just like the first READ in the program: It starts at the first item in the first DATA statement. This lets a program use the same data more than once.

computing for families

Computers And The Audiovisual Imagination

Fred D'Ignazio
Associate Editor

We've all heard how it's good to write using words that evoke vivid images—ripening pumpkins, booming thunderstorms, hot freshly baked bread, creaking doors, and spinning carousels. It's because these words trigger our readers' sense of smell, sight, hearing, touching, etc. The words recall experiences from the readers' memories and allow them to vicariously experience a new event through their own imagination.

But which comes first—imagination or words? Do we imagine something first, and then tell others what we have imagined? Or, as my mother used to say, do we set our mouth in motion before we put our mind in gear?

Flannery O'Connor once wrote, "I write because I don't know what I think until I read what I say."

In my career as a writer I've discovered the same thing. Thoughts pop into my head all the time, but the thoughts are little more than fireflies flitting about in a darkened sky. It's only when I write my thoughts down that I clearly perceive what they are and why they are meaningful.

I've learned that in trying to communicate my thoughts to other people I am also learning to imagine things more vividly myself. If I can't state something briefly and clearly, the chances are it's because my image of it is incomplete, fuzzy, or muddy. The writing—rewriting, editing, and revising—process is a way for me to learn a subject well enough to communicate its essence to someone else—and to myself.

So writing—or communicating—is also imagining; they go hand in hand. But what kind of imagining am I actually doing?

How does your imagination work? Do you imagine in words? Lists? Do your thoughts take the form of old black-and-white movies? Are they Technicolor extravaganzas, complete with Dolby sound? Or perhaps they are more like my little fireflies.

I know how I imagine, and it's not in words. It's in images, emotions, and sensual feelings—smells, sounds, muscular contractions, sensations of being hot, cold, hungry, or excited—a whole symphony of little feelings and impressions that combine to form a single thought. Even a simple thought.

But I can't express the thought in this raw form; I have to translate the thought into words. This is a laborious and time-consuming process. The computer can help us translate our thoughts into words. But, up until now, that's all it has been—a thought-to-word translator. Think of how much more valuable it would be if we could use it as a medium for expressing our thoughts directly—as images, sounds, voices, scenes, events—as well as in words. If we could do this, we would be using the computer as a *hotline to our imagination*. And by encouraging us to communicate audiovisually, it could enrich, strengthen, and develop our imagination.

Up until now, computers have communicated other people's imaginations to us audiovisually, but, with rare exceptions, they have not given us the ability to communicate at this level ourselves. Or even to imagine at this level. But in another year or two, multimedia computing will be here. We will have optical read-write discs that will let us cut and paste images, sounds, music, voices, words, figures—you name it. We will all have the chance to become multimedia thinkers and communicators using our *imagination processors*.

That technology has not yet arrived. But we don't have to wait. We can use computers along with other devices—cassette recorders, VCRs, and video cameras. We can create pictures and words on the computer, music and voices on the cassette recorder, and combine them all on a videotape and play them back on a VCR. We can supplement the computer's images with images shot with a video camera.

My children (Catie, 10, and Eric, 7) and I are doing this now. We recently created a computer animation of a black hole, then added music from the soundtrack of the movie *Jaws* and Catie's narration of the life cycle of black holes. Now we are working on a movie about a creek we discovered behind our house that we call "Big Creek." We're using computer paint and animation programs to produce a map of Big Creek and the titles, credits, and graphics for our movie. We have combined these with narrations and lots of video shots of us actually exploring Big Creek. And there's a story line, too: how Big Creek is being affected by a housing development going up alongside it.

How would *you* use a computer as an imagination processor? Please write me, care of COMPUTE!'S GAZETTE. You can communicate your ideas in words. But I'd also love to see some videos, audio tapes, cartoons, and drawings. You can use your computer as a multimedia tool to express your imaginative ideas. In the next century, multimedia communicators and multimedia thinkers will be in great demand. We can all get started learning how to think, communicate, and imagine at this level now.

hints & tips

Simulating PRINT-AT and APPEND

If you've discovered a clever time-saving technique or a brief but effective programming shortcut, send it to "Hints & Tips," c/o **COMPUTE!'s GAZETTE.** ***If we use it, we'll pay you $35. Due to the volume of items submitted, we regret that we cannot reply individually to submissions.***

Simulating PRINT-AT

Hue Thao

Some BASICs have a PRINT-AT or PRINT@ command which allows you to position a message anywhere on the screen simply by specifying the row and column where you want it printed. The 128, Plus/4, and 16 have CHAR, which works like a PRINT-AT. The CHAR command can be used on the normal text screen (40 or 80 columns) or on a hi-res screen.

Unfortunately, the 64 and VIC don't have a BASIC keyword for positioning the cursor. There is, however, a machine language Kernal routine to move to a given location, and it's easy to call from BASIC. You don't need to know any machine language to use the PLOT routine, you just use a few POKEs and a SYS. Try typing the following program (for 64 and VIC only):

```
10 PRINT CHR$(147): REM CLEAR
   {SPACE}SCREEN
20 POKE781,15: REM ROW
30 POKE782,4: REM COLUMN
40 POKE783,48: REM CLEAR CARRY
50 SYS65520: REM PLOT ROUTINE
60 PRINT"ROW 15 COLUMN 4"
```

The first column on the screen is numbered 0 (not 1, as you might expect), so you're allowed to use column numbers from 0–39 on the 64 or 0–21 on the VIC. Likewise, the rows can be in the range 0–24 (64) or 0–22 (VIC).

The next time you're thinking about printing 19 cursor down characters and 15 cursor rights to print something in the right place on the screen, remember the Kernal PLOT routine. It might save you some time.

Combining Two Programs

Donald E. Fulton

The March "Hints & Tips" contained a useful technique for merging two programs on the 128. Here's a way to append two programs on other Commodore machines, including the 64, Plus/4, 16, and VIC. It works with disk drives and tape drives.

Load the first program into memory. Find out where the BASIC program area begins by entering the following line which prints the contents of the start-of-BASIC pointer:

```
PRINT PEEK(43), PEEK(44)
```

Write down the two numbers. On the 64, they should be 1 and 8. VIC values will vary, depending on how much memory expansion is present. The Plus/4 and 16 may have one of two values, depending on whether you've used the graphics area. Owners of the Plus/4 and 16 should type GRAPHIC CLR before using the PEEKs above to make sure there's no memory set aside for a hi-res screen.

Next, type the following line, which calculates the ending address for the BASIC program:

```
X = PEEK(45) + 256*PEEK(46): PRINT X
```

If the start of BASIC is moved up to this location—the end of the first program—you can load a second program to the new (higher up) memory address and then move the start of BASIC back to where it was originally. The second program will be added to the end of the first. But there's a catch: The start of BASIC should be moved to two locations below the current end-of-BASIC. Otherwise, the two zeros that mark the end of a program will get in the way. Enter this line next:

```
POKE 44, INT((X−2)/256): POKE 43,
  (X−2) AND 255: NEW
```

Load the second program from tape or disk. This program must have higher line numbers than the first program, so you may have to use a renumbering utility (or renumber it by hand). Finally, restore the original start-of-BASIC pointer:

```
POKE 43,1: POKE 44,8
```

If you have a Plus/4, 16, or VIC, substitute the values PEEKed from 43–44 when you first started. The new program can now be saved.

The same technique will work on the 128 if you use 45–46 instead of 43–44 for the start-of-BASIC pointer and 4624–4625 (in place of 45–46) for the end-of-BASIC pointer. The method described in the March issue is preferable, though, because it does a true merge of two programs, rather than a simple append.

There's an easier way to append two programs if you have access to the *SpeedScript* word processor. It's based on the same principle as the PEEKs and POKEs above.

Load and run *SpeedScript* and use it to load the first program *as if it were a text file*. It's a program, not a *SpeedScript* file, so it will look very strange. Pay no attention to its appearance. Without changing anything, go to the end of the file. There you'll see three commercial-at signs (@@@). These are the three zeros at the end of the program. Delete the last two (at the very end of the file), so only one remains. Now, without moving the cursor, load the second program into *SpeedScript*. If you want to append a third program, this process can be repeated.

Save the resulting file and exit *SpeedScript*. Since the combined program has been saved from high in memory, you'll have to load it with a ,8 instead of ,8,1. If you LIST it, you should see that the second program has been appended to the first.

horizons

What Is A Raster Interrupt?

Todd Heimarck
Assistant Editor

Two decades ago, words like *subroutine* and *debug* were jargon, part of a secret language spoken only by a tiny cabal of programmers. As more and more people have bought home computers, these words and others have become fairly commonplace. There's still a sort of secret knowledge, though: machine language (ML). To BASIC programmers, terms like *raster interrupt* may not make a lot of sense. Let's take a look at what an interrupt is and see one in action.

Machine language isn't especially complex. In fact, you're very limited in what you can do. Imagine writing a program with only PEEK, POKE, AND, OR, IF-THEN, GOSUB, and GOTO. You're also able to add, subtract, multiply by two, and divide by two. The proper combination of small ML commands can accomplish amazing things, however, just as thousands of small bricks can be made into a mansion.

As one illustration of BASIC's speed, type in and run the following one-line program for the 64. It switches the border color between white and red as fast as possible:

```
10 POKE53280,1:POKE53280,2:GOT
   O10
```

Press STOP to stop the program. Now try this ML program (also for the 64):

```
10 FORJ=49152TO49164:READA:CK=
   CK+A:POKEJ,A:NEXT
20 IFCK<>1788THENPRINT"PLEASE
   {SPACE}CHECKING YOUR TYPI
   NG."
30 SYS49152
100 DATA169,1,141,32,208,234,1
    69
110 DATA2,141,32,208,208,243
```

The machine language, slightly more than a dozen bytes long, is encoded in DATA statements. Press RUN/STOP-RESTORE to turn it off.

A TV screen is redrawn 60 times a second, 262 screen lines (also called *raster* lines) at a time. Characters are eight lines tall, so the 25 rows need 200 lines, with 62 left over for the top and bottom screen borders. Multiplying 60 screens by 262 lines tells you that roughly 15,000 raster lines are drawn every second. If you look closely at the top or bottom border while the ML program is running, you'll see that the border color is changing approximately eight times per line, which means the machine language instructions to switch color are taking only about 1/120,000 of a second. That's fast.

Both the BASIC and ML programs take over the 64 while they're running. You can't list a program or perform a calculation while either one is busy changing screen colors. Here's where we call on a raster interrupt, which gives control of the computer back to us.

Waiting For A Chance To Interrupt

The 6510 chip, the brains of the Commodore 64, is built to run programs. Once in a while, however, it must stop what it's doing to interact with the outside world. Every sixtieth of a second, the processor in the 64, the 6510 chip, puts aside what it's doing to read the keyboard and click the jiffy clock.

But the 6510 can't be trusted to automatically perform this task; left to itself it would continue running whatever program was in memory, ignoring the keys you might be pressing. So one of the CIA chips is entrusted with an alarm clock; 60 times a second it has to remind the 6510 that it's time to do some things like checking the keyboard.

This reminder is an *interrupt request* (IRQ) which diverts the processor from the main job of running a program for a short while. The normal IRQ that checks for keypresses is invisible to BASIC and ML programmers. It's automatic.

There's another sort of IRQ, one that's programmable. The VIC chip, which handles everything that's printed to the screen, can trigger an interrupt based on sprite collisions, light pen input, or the raster line currently being drawn.

The raster interrupt program (in the Program Listings section) tells the VIC chip to wait for something to happen on the screen before it asks the CIA chip to generate an interrupt. Unlike the normal interrupt, which is based on a clock, a raster interrupt sets an alarm to go off when a certain line of the screen is being drawn. At that point, the processor is told to go to a short ML program that changes the border and background colors, after which it returns to what it was doing. If we set the alarm to go off at several places on the screen, we can create zones of color, each with its own border and background color. In between interrupts, the processor can run regular BASIC programs.

Being able to change the screen color might not seem like much, but there are several good uses for the raster interrupt technique. If you've ever seen a game that uses more than eight sprites, you've seen a raster interrupt in action. The idea is the same as the color bar program: You set the interrupt to happen at a certain line on the screen. Then the sprite pointers are changed, so the video chip thinks the sprites are at a new location. The split screen graphics modes on the 128 (GRAPHIC 2 and GRAPHIC 4) also rely on a raster interrupt. These two commands allow you to create a hi-res screen on the top portion of the screen, with a text area down below.

See program listing on page 108.

news & products

Daisy Wheel Printer

Silver Reed America has introduced the EXP420, a letter-quality daisy wheel printer that prints 12 characters per second. The EXP420 works with almost any computer, including the Commodore 64 and 128, and offers super and subscripts, bold and shadow print, auto-underline, 10 and 12 pitch selection, bidirectional printing, and a built-in Commodore and parallel interface. The printer also comes in a serial model.

The EXP420 printer has a suggested retail price of $299.95.

Silver-Reed America, Inc., 19600 S. Vermont Ave., Torrance, CA 90502.

Circle Reader Service Number 219.

Spelling Aid

Whole Brain Spelling from SubLOGIC teaches you a method for learning how to spell. It includes 200 ten-word lists in six different categories—general, a child's garden of words, fairy tale, scientific, medical, and business. Color graphics provide positive feedback. For the Commodore 64/128 with one disk drive and color monitor.

Whole Brain Spelling is available for $29.95 plus $2.00 shipping and handling.

SubLOGIC Corporation, 713 Edgebrook Dr., Champaign, IL 61820.

Circle Reader Service Number 220.

Disk Cataloger

Fastcat/64 is a machine language disk cataloger for the Commodore 64, SX-64, and 128. It supports multiple catalogs, each containing up to 1200 entries. *Fastcat/64* also provides automatic catalog updating, onscreen catalog review, status reports during cataloging, and a variety of ways to extract hardcopy listings of catalog entries. This software is not copy protected. Requires disk drive; printer and color monitor are optional.

Fastcat/64 is available only by mail order for $20.00 . A demonstration version is available for $5.00.

R. J. Biancosino, 38 S. Ogle Ave., Wilmington, DE 19805.

Circle Reader Service Number 221.

KETEK's Command Center for the Commodore 128 computer system.

Command Center For Commodore 128

Commodore 128 owners can now consolidate their peripherals into one custom-designed unit recently released by KETEK.

The Command Center is a space-saving cabinet that comes complete with its own built-in drive/CPU cooling fan, telephone/modem control switch, master AC switch, and AC power strip with six outlets. A useful device for uncluttering and upgrading the appearance of the 128 workspace, the Command Center is designed to contribute to the longevity of a C-128 system by protecting the system from overheating. In addition, the Command Center offers line noise filtering and protection from voltage spikes and power surges.

Suggested retail price for the Command Center is $149.95 plus $3.50 shipping and handling.

KETEK, P.O. Box 203, Oakdale, IA 52319.

Circle Reader Service Number 222.

Programming Tool Kit, Compiler

SM Software has introduced *Gnome Speed*, a BASIC compiler for the Commodore 128 computer, and *Gnome Kit*, a programming tool kit for the Commodore 64 and 128 computers.

Gnome Speed compiles virtually all BASIC 7.0/2.0 commands and functions. Programs can be as large as 1,999 lines, and have up to 8000 jumps and 500 distinct variable names. A number of BASIC commands, such as IF-THEN-ELSE, are enhanced. The compiler checks for coding errors, and has an option to list to the printer. Backups are possible, since the program is not copy-protected.

Gnome Kit is a machine code program that contains programming, structuring, and debugging aids for the 64 and 128 (64 and 128 versions on same disk). It contains not only BASIC aids, but also a full assembler/disassembler and editor for machine language programmers. The program's B Facility lets you restructure your BASIC programs with RENUMBER, MERGE, and APPEND commands. FIND revises a program by finding variables, commands, text strings, and line references. HELP and TRACE debugging commands are included.

The M Facility in *Gnome Kit* lets you create machine language programs with the assembler/disassembler. Code can be input/output as hexadecimal/decimal, byte, low/high byte, or ASCII. Extensive restructuring and debugging tools are also included. The F Facility, for advanced programmers, offers direct access to disk drive memory and the disk itself. You can extend DOS with user routines and restore corrupted disks, among other functions. *Gnome Kit* is not copy-protected.

Suggested retail prices are $39.95 for *Gnome Kit* and $59.95 for *Gnome Speed.*

SM Software, Inc., P.O. Box 27, Mertztown, PA 19539-0027.

Circle Reader Service Number 223.

Software Programs From Mindscape

Several new software packages for the Commodore 64 have been introduced by Mindscape. *Bop'n Wrestle* is a three-dimensional combat sports simulation for pro wrestling enthusiasts. Using either a joystick or the keyboard, one or two players battle for the World Championship Belt.

As Captain Johnny *Jimbo-Baby* McGibbits, you must fly your Whizbang Gizmo DHX-1 Attack Chopper through enemy air space to reach targets designed to destroy the Mad Leader's military force. Three missions combine helicopter flight simulation and military ground action. You are aided by your flight manual, secret communication code names, mission information, weapons, film, and pocket edition of *The McGibbits Guide to Ground Installation Infiltration.*

The object of *Spell of Destruction* is to enter the Castle of Illusions, find the Prime Elemental, and destroy it with a single spell. Your quest takes you through over 70 locations with scrolling 3-D graphics and music.

Great British Software, Volume I combines three games on one disk. In *Brian Bloodaxe* you invade Britain and seek the crown jewels among over 100 puzzle-filled screens. You travel through 45 caverns of death and 400 scrolling screens to fight the Monster of the Apocalypse in *Revelation.* And in *Quovadis,* you battle the Dark Lord to free humankind .

Bop'n Wrestle, Infiltrator, and *Spell of Destruction* have a suggested retail price of $29.95 each. *Great British Software* has a retail price of $14.95.

Mindscape, Inc., 3444 Dundee Rd., Northbrook, IL 60062.

Circle Reader Service Number 224.

Hardware From Master Software

Master Software has introduced four hardware interconnection products for Commodore personal computers. You can place port devices in more convenient locations with Modem Master, a four-foot extender for the user port of the VIC-20, Commodore 64, SX-64, Plus/4, and 128. The extender is made of tangle-proof ribbon cable and has keyed connectors to prevent incorrect installation.

The Modem Master Plus has all the features of Modem Master, plus a buffered system reset switch that resets the Commodore 64 and SX-64 and VIC-20 in case of computer lock-up. There are programs included to help recover the BASIC program in memory at the time of the lockup.

You can use two printers with one computer when you use Y-Not, a six-foot Y cable. Y-Not contains one male six-pin plug and two female six-pin jacks that fit the six-pin serial port of all Commodore computers.

The 80 Mono Cable lets you use the Commodore 128's 80-column mode without an RGB monitor. This six-foot cable plugs into the RGBI port of the computer and the video input jack of the monitor to produce an 80 column monochrome display on any composite color or monochrome monitor.

List price for Modem Master is $29.95 and $34.95 for Modem Master Plus. Y-Not retails for $15.00 and the 80 Mono Cable is priced at $9.00.

Master Software, 6 Hillery Ct., Randallstown, MD 21133.

Circle Reader Service Number 225.

---

128 Software From Abacus

Abacus Software has released two new software packages for the Commodore 128. *Cadpak-128* is the 128 version of *Cadpak-64,* a computer-aided design (CAD) drawing and design package. *Cadpak-128* features accurately scaled output, accupoint positioning, four-screen detail, and support of any high-quality lightpen.

Super C Version 3 is the 128 version of *Super C for the C-64.* This C language includes complete implementation of K & R definition, graphics and math libraries, RAM disk support, Unix-like shell, and machine language interface.

Cadpak-128 and *Super C Version 3* retail for $59.95 each.

Abacus Software, P.O. Box 7219, Grand Rapids, MI 49510.

Circle Reader Service Number 226.

Timeworks' 128 Spreadsheet

Timeworks has released an enhanced version of *Swiftcalc 128* for the Commodore 128. This electronic spreadsheet for home and business use features high resolution graphics, swiftkey macros, swift-DOS, and multi-level sorting. It can be interfaced with Timeworks' *Word Writer 128* and *Data Manager 128* and uses an 80-column monitor.

Suggested retail price for *Swiftcalc 128* is $69.95. Backup disks for Timeworks registered users are available for $14.70.

Timeworks, 444 Lake Cook Rd., Deerfield, IL 60015.

Circle Reader Service Number 227.

New Software From Firebird

Three new software packages are now available from Firebird. *Colossus Chess IV* is a two- and three-dimensional display chess program that supports all rules of chess, including under-promotions, the fifty-move rule, and all draws by repetition. There are multiple difficulty levels as well as provisions for saving the games and recreating previous board settings. The package includes an instruction manual and classic game libraries on disk. A disk drive is required; joystick is optional.

The Arc of Yesod is a moon-based action adventure in which the player must overcome numerous obstacles in order to locate and destroy a device buried in the lunar caverns.

The companion adventure to *The Arc of Yesod, The Nodes of Yesod,* also takes place on the moon. There are several twists to this adventure on the opposite side of the flippy disk. Both lunar adventures include animation, sound, and music. Joystick is optional.

Colossus Chess IV has a suggested retail price of $34.95. *The Arc of Yesod* and *The Nodes of Yesod* retail for $19.95 on one disk.

Firebird Licensees, 74 N. Central Ave., Ramsey, NJ 07446.

Circle Reader Service Number 228.

The Print Shop Companion

The Print Shop Companion from Brøderbund Software adds even more design tools to Brøderbund's *The Print Shop.* New features include the multi-tool Graphic Editor+, a font editor, a border editor, Tile Magic, Creature Maker, Calendar Maker, and a fast load utility. This enhancement adds 12 new fonts, 50 new borders, 24 numeric graphics, and a set of bonus graphics to *The Print Shop.*

The Print Shop Companion for the Commodore 64/128 requires 64K memory, a disk drive, joystick, and *The Print Shop.*

Suggested retail price is $34.95.

Brøderbund Software, Inc., 17 Paul Dr., San Rafael, CA 94903-2101.

Circle Reader Service Number 229.

Bowling Game From Access

Compete in a bowling league with up to eight different bowlers with *Tenth Frame* from Access Software. This bowling simulator incorporates computerized scoring, sound effects, graphics, 3-D animation, and multiple levels of play into a bowling game for the Commodore 64/128.

Tenth Frame is on disk and a joystick is required.

Suggested retail price is $39.95.

Access Software, Inc., 2561 S. 1560 West, Woods Cross, UT 84087.

Circle Reader Service Number 230.

Two-On-Two Basketball Action

Teamwork is the key in *GBA Championship Basketball: Two-on-Two* from Gamestar. This basketball simulator allows one or two players to play teams of two against each other or the computer. Each team can take part in practice sessions, two-on-two competition, or league competition in the Gamestar Basketball Association.

A two-man team consists of a primary player who is given a playing style by the computer user and a secondary player drafted from a list of ten basketball superstars. Court action is enhanced by graphics and background crowd sounds. Game statistics are compiled on the sports page of the *Gamestar Gazette.*

Available for $34.95 for the Commodore 64/128.

Gamestar/Activision, Inc., 2350 Bayshore Frontage Rd., Mountain View, CA 94043.

Circle Reader Service Number 231.

Little Black Book Data Management

Computer Management Corporation's *NamePro* is a database management program that lets you maintain a list of up to 500 names with addresses, phone numbers, and up to five comments per name on the Commodore 64. You can sort the names into eight different categories and print the list onto cards, mailing labels, regular paper, or a special pocket-size phone book. A vinyl cover is included for your phone book.

A utility program subdivides the database if you need to store more than 500 names.

NamePro retails for $24.95.

Computer Management Corporation, P.O. Box 4819, Walnut Creek, CA 94596.

Circle Reader Service Number 232.

Machine Language Editor And Assembler For C-128

Hughes Associates has announced the availability of the *Freedom Assembler* and *Freedom Editor* for the Commodore 128.

The *Freedom Assembler-128* is a symbolic assembler. Its cartridge format allows you to leave it plugged in all the time if you like, even while other programs are running. The assembler takes advantage of the 128's speed and memory capacity. It retails for $49.95. The *Freedom Editor-128* is a companion editor program that starts where the Commodore 128 leaves off. All the resident 128 commands plus 25 more -- like COPY, BINARY, RESAVE, and SCREEN DUMP -- simplify programming chores. It retails for $29.95.

Both programs are also available in Commodore 64 format. The *Freedom Assembler-64* is $39.95, and the *Freedom Editor-64* is $29.95.

Hughes Associates, 45341 Harmony Ln., Belleville, MI 48111.

Circle Reader Service Number 233.

3-D Adventure Game For Commodore 64

Mindscape has announced the release of *Fairlight*, a three-dimensional graphic adventure game for the Commodore 64. The game takes place in the mythical Land of Fairlight, a once beautiful and radiant place that has lost its magic. As Ivar, it is your mission to find the powerful Book of Light and restore the Land of Fairlight to its former glory. *Fairlight* will be available in August at a suggested retail price of $29.95.

Mindscape, Inc., 3444 Dundee Rd., Northbrook, IL 60062.

Circle Reader Service Number 234.

Computerized Guitar Tutorial

GIT guitar school instructors Don Mock and Dan Kessler have developed *Big Ears INTERVALS*, an ear training program for aspiring guitarists. Accompanied by a 20-page instructional booklet, the program was designed to be an effective learning tool for guitarists of all levels of ability.

Guitar neck fingerboards display the intervals, and the 64's 3-voice internal synthesizer or MIDI-out capabilities perform them. The user inputs an answer with joystick or keyboard, and receives an immediate CORRECT or INCORRECT display. To make tracking progress easy and effective, a score graph displays intervals tested and the total score. Diatonic, chromatic, and compound intervals are taught.

Big Ears INTERVALS is available for $35 plus $1.25 postage and handling.

MI Instructor Series, P.O. Box 80541, Seattle, WA 98108.

Circle Reader Service Number 235.

Foreign Language Data Disks For *Remember!*

DesignWare has released a French vocabulary disk and Spanish vocabulary disk for use with *Remember!*. Each disk includes over 650 words.

Remember! is a learning tool that helps students study and learn facts, lists, or relationships in almost any subject through various study options built into the program. While students can easily enter their own study material, DesignWare has received numerous requests for supplemental data disks, including foreign language vocabulary and SAT preparation. Other data disks are expected to be available later this year.

Each of the foreign language disks retails for $19.95.

DesignWare, 185 Berry St., San Francisco, CA 94107.

Circle Reader Service Number 236.

Solve The Puzzle And Win $50,000

Rush Ventures, the North American distributor of Great Britain's popular Domark computer games, has announced a contest in conjunction with the U.S. launch of the company's game line.

Eureka!, the first game to be released here, consists of five linked adventures that take the player on a journey through time, starting with prehistoric times, on to Nero's Rome, Arthurian Britain, World War II and Colditz prison, and winding up in the present with a 007-type spy adventure. The object of the game is to defeat enemies in each adventure and save the world from destruction.

But solving the adventures is only part of the challenge. *Eureka!* comes with an illustrated booklet containing riddles that give clues to the final solution. With every riddle unraveled, the player builds up a secret telephone number. The first person to discover it and dial it wins $50,000. (A similar contest was held in the U.K., and a 15-year-old boy solved it.) The contest starts July 4, 1986, and runs for twelve months.

Suggested retail price for *Eureka! is $24.99.* Rush Ventures will also be releasing several other Domark titles in upcoming months, including *View To A Kill, Friday The 13th, Codename MAT II,* and *Gladiator.* All are expected to retail for $22.99.

Rush Ventures, Inc., P.O. Box 8079, Blaine, WA 98230

Circle Reader Service Number 237.

Murder Mystery On The Mississippi

Activision has released *Murder On The Mississippi*, a graphics-and-text adventure set on a Mississippi riverboat in the 19th century. As Sir Charles Foxworth, a famous British sleuth who discovers that a murder has been committed, it is your job to find the murderer before the boat docks in New Orleans.

Adam Bellin, the program's developer, has designed a unique user interface that is completely joystick-driven. During the Delta Princess' three-day journey down the Mississippi, Foxworth and his constant companion Regis Phelps must explore the riverboat's four decks and 24 rooms where they will cross-examine eight colorful characters. Building the case correctly—examining evidence and thoroughly questioning suspects—is a must, since a false accusation may result in serious consequences for Sir Charles.

Murder On The Mississippi is available for the Commodore 64 at a suggested retail price of $34.95.

Activision, Inc., 2350 Bayshore Frontage Rd., Mountain View, CA 94043.

Circle Reader Service Number 238.

bug-swatter

Modifications and Corrections

• The first portion of "Disk File Archiver" (December 1985) was scrambled; the program does not work as listed. We regret any inconvenience this may have caused our readers. Herewith the correct listing. Type it in with the current version of MLX, using a starting address of 0801 and ending address of 09B8.

```
0801:0B 08 00 00 9E 32 30 36 EC
0809:31 00 00 00 A9 0A 8D 82 C4
0811:02 20 18 08 4C 94 E3 A2 CC
0819:4C A0 08 8E 32 03 8C 33 4B
0821:03 60 20 CF FF 20 CF FF EB
0829:A9 0D 20 D2 FF 20 CF FF A2
0831:48 20 D2 FF 68 C9 0D D0 1D
0839:F4 20 68 09 A2 80 6C 00 59
0841:03 A9 A0 A0 09 20 1E AB 0C
0849:4C 3A 08 A5 BB 85 02 A5 07
0851:BC 85 03 A5 B7 85 04 20 D7
0859:ED F5 A9 00 20 BD FF 20 2B
0861:57 09 20 CF FF C9 32 B0 9C
0869:03 4C 3A 08 C9 36 D0 B2 51
0871:20 CF FF C9 33 D0 AE 20 7C
0879:CF FF C9 0D D0 F9 20 68 92
0881:09 A9 20 A0 27 99 3C 03 A9
0889:88 10 FA A4 04 C0 0B B0 75
0891:B0 88 B1 02 99 3F 03 99 DB
0899:4E 03 88 10 F5 A9 2E 8D E3
08A1:49 03 8D 58 03 A9 34 8D 03
08A9:4A 03 A0 02 B9 88 09 99 6F
08B1:3C 03 88 10 F7 A9 0F A2 D9
08B9:3C A0 03 20 BD FF 20 57 F7
08C1:09 20 68 09 A0 02 B9 85 02
08C9:09 99 3C 03 99 4B 03 88 05
08D1:10 F4 A9 3D 8D 4B 03 A9 79
08D9:34 8D 4A 03 85 FE A9 33 8F
08E1:8D 59 03 A9 1E A2 3C A0 9E
08E9:03 20 BD FF 20 57 09 20 CB
08F1:CF FF C9 32 90 02 C6 FE 5F
08F9:20 68 09 20 71 09 CE 4A EE
0901:03 CE 59 03 AD 59 03 C9 46
0909:30 D0 D8 A9 20 8D 58 03 08
0911:8D 59 03 A5 04 18 69 12 60
0919:A2 3C A0 03 20 BD FF 20 E7
0921:57 09 20 68 09 A9 00 85 20
0929:9D A9 8B A0 09 20 1E AB A0
0931:A5 FE 20 D2 FF A9 02 A8 5A
0939:A2 08 20 BA FF A5 04 A2 8F
0941:3F A0 03 20 BD FF A9 2B E9
0949:A6 2D A4 2E 20 D8 FF A9 7F
0951:80 85 9D 4C 5B 08 A9 0F DA
0959:A2 08 A8 20 BA FF 20 C0 AC
0961:FF A2 0F 20 C6 FF 60 A9 A0
0969:0F 20 C3 FF 20 CC FF 60 18
0971:A9 00 20 BD FF 20 57 09 70
0979:20 CF FF C9 0D D0 F9 20 EB
0981:68 09 60 00 52 30 3A 53 31
0989:30 3A 0D 91 52 45 4E 41 82
0991:4D 45 1D 1D 1D 1D 1D 1D C5
0999:1D 1D 1D 1D 1D 2E 00 0D A5
09A1:46 49 4C 45 4E 41 4D 45 5E
09A9:20 54 4F 4F 20 4C 4F 4E DE
09B1:47 0D 00 00 00 00 00 00 AA
```

• "The Coordinator" (March) works as described. Program 5, "Save/Load Subroutine" does not properly preserve the VIC chip registers when files are saved to disk, however. This does not directly affect graphics files loaded from within The Coordinator.

Adding line 292 and modifying line 315 as shown below restores the option of directly loading picture files created by The Coordinator.

```
MF 292 PRINT" SCREEN RETURNS T
       O DISPLAY FOR SAVE":FOR
       TD=0TO2000:NEXT:GOSUB18
       5
KF 315 SF=1:GOSUB165:SF=0:PRIN
       TE$"{DOWN}{RIGHT}{RVS}
       {SPACE}SAVE COMPLETED
       {OFF}":FORTD=0TO2000:NE
       XT:GOTO340
```

Once the save/load routine has been fixed, you can use the following stand-alone program to load and display any Coordinator pictures saved to tape or disk. This routine may be used as is, without any need to load The Coordinator or the ancillary programs. (Tape users should change the 8 to 1 in line 20.)

```
GG 1 ON-(A=1)-2*(A=2)-3*(A=3)-
     4*(A=4)GOTO20,20,30,40
BH 2 PRINTCHR$(147):INPUT"
     {DOWN}{RIGHT}ENTER COORD
     {SPACE}FILENAME";N$
CD 3 PRINT"{DOWN}{RIGHT}PRESS
     {SPACE}M IF MULTICOLOR, N
      IF NOT"
AF 4 GETR$:IFR$<"M"ORR$>"N"THE
     N4
BH 5 M=ASC(R$)-76:PRINT"{DOWN}
     {RIGHT}PRESS BANK (0,1,2,
     3)"
CH 6 GETBA$:IFBA$=""THEN6
EF 7 BA=ASC(BA$):IFBA<48ORBA>5
     1THEN6
EB 8 BA=BA-48
QF 20 A=A+1:P$=STR$(A):P$=RIGH
      T$(P$,1):LOADP$+N$,8,1
EA 30 IF A=3ANDM=1THEN20
EK 40 POKE56576,(PEEK(56576)AN
      D252)OR(3-BA)
AE 50 GOTO50
```

• Some readers have had difficulty using the Find (SHIFT-F) command in "Mini-Filer." The program searches forward in memory, so before using Find, you should go to the first record in the file. SHIFT-F will find the first record that matches. If you use the command a second time, it will find the second record, and so on. The reason Mini-Filer doesn't automatically start at the beginning of the file is that if it did so, it would find only the first match (the first Johnson entry, but not any other Johnsons, for example).

Reader Timothy W. Williams has suggested that the screen color combination is not ideal, especially if you use a television. To change Mini-Filer, he suggests POKEing 2062 with your preferred border color and POKEing 2084 with a different screen color.

• A portion of line 0869 is missing from "Meteor Strike" (July):

```
0869:00 D0 18 7D 36 08 8D 00 75
```

• An extraneous question mark appears in "Directory Filer" (April). The last command on line 1040 should be GOTO 840, not GOTO 84?0. Also, some readers were stymied by the {STOP} in line 880. This is the unshifted RUN/STOP key. When typed inside quotation marks, {STOP} appears as a reversed letter C. Finally, Plus/4 users who were unable to type {F1}, because of the Plus/4's predefined function keys, should use the KEY command to change f1 to CHR$ (133). For more details about KEY, see this month's "Gazette Feedback."

• "TurboCopy" (April) works as published with the 1541 disk drive, for which it was designed, but does not work with the 1571.

COMPUTE!'s GAZETTE Author Guide

Here are some suggestions which serve to improve the speed and accuracy of publication for prospective authors. COMPUTE!'s GAZETTE is primarily interested in new and timely articles on the Commodore 128, 64, Plus/4, 16, and VIC-20. We are much more concerned with the content of an article than with its style, but articles should as be clear and well-explained as possible.

The guidelines below will permit your good ideas and programs to be more easily edited and published:

1. The upper left corner of the first page should contain your name, address, telephone number, and the date of submission.

2. The following information should appear in the upper right corner of the first page. If your article is specifically directed to one model of computer, please state the model name. In addition, *please indicate the memory requirements of programs.*

3. The underlined title of the article should start about 2/3 of the way down the first page.

4. Following pages should be typed normally, except that in the upper right corner there should be an abbreviation of the title, your last name, and the page number. For example: Memory Map/Smith/2.

5. All lines within the text of the article must be double- or triple-spaced. A one-inch margin should be left at the right, left, top, and bottom of each page. No words should be divided at the ends of lines. And please do not justify. Leave the lines ragged.

6. Standard typing or computer paper should be used (no erasable, onionskin, or other thin paper) and typing should be on one side of the paper only (upper- and lowercase).

7. Sheets should be attached together with a paper clip. Staples should not be used.

8. If you are submitting more than one article, send each one in a separate mailer with its own tape or disk.

9. Short programs (under 20 lines) can easily be included within the text. Longer programs should be separate listings. *It is essential that we have a copy of the program, recorded twice, on a tape or disk.* If your article was written with a word processor, we also appreciate a copy of the text file on the tape or disk. Please use high-quality 10 or 30 minute tapes with the program recorded on both sides. The tape or disk should be labeled with the author's name and the title of the article. Tapes are fairly sturdy, but disks need to be enclosed within plastic or cardboard mailers (available at photography, stationery, or computer supply stores).

10. A good general rule is to spell out the numbers zero through ten in your article and write higher numbers as numerals (1024). The exceptions to this are: Figure 5, Table 3, TAB(4), etc. Within ordinary text, however, the zero through ten should appear as words, not numbers. Also, symbols and abbreviations should not be used within text: use "and" (not &), "reference" (not ref.), "through" (not thru).

11. For greater clarity, use all capitals when referring to keys (RETURN, CTRL, SHIFT), BASIC words (LIST, RND, GOTO), and the language BASIC. Headlines and subheads should, however, be initial caps only, and emphasized words are not capitalized. If you wish to emphasize, underline the word and it will be italicized during typesetting.

12. Articles can be of any length—from a single-line routine to a multi-issue series. The average article is about four to eight double-spaced, typed pages.

13. If you want to include photographs, they should be either 5×7 black and white glossies or color slides.

14. We do not consider articles which are submitted simultaneously to other publishers. If you wish to send an article to another magazine for consideration, please do not submit it to us.

15. COMPUTE!'s GAZETTE pays between $70 and $800 for published articles. In general, the rate reflects the length and quality of the article. Payment is made upon acceptance. Following submission (Editorial Department, COMPUTE!'s GAZETTE, P.O. Box 5406, Greensboro, NC 27403) it will take from two to four weeks for us to reply. If your work is accepted, you will be notified by a letter which will include a contract for you to sign and return. *Rejected manuscripts are returned to authors who enclose a self-addressed, stamped envelope.*

16. If your article is accepted and you have since made improvements to the program, please submit an entirely new tape or disk and a new copy of the article reflecting the update. We cannot easily make revisions to programs and articles. It is necessary that you send the revised version as if it were a new submission entirely, but be sure to indicate that your submission is a revised version by writing, "Revision" on the envelope and the article.

17. COMPUTE!'s GAZETTE does not accept unsolicited product reviews. If you are interested in serving on our panel of reviewers, contact our Features Editor for details.

How To Type In *COMPUTE!'s GAZETTE* Programs

Each month, COMPUTE!'s GAZETTE publishes programs for the Commodore 128, 64, Plus/4, 16, and VIC-20. Each program is clearly marked by title and version. Be sure to type in the correct version for your machine. All 64 programs run on the 128 in 64 mode. Be sure to read the instructions in the corresponding article. This can save time and eliminate any questions which might arise after you begin typing.

We frequently publish two programs designed to make typing easier: The Automatic Proofreader, and MLX, designed for entering machine language programs.

When entering a BASIC program, be especially careful with DATA statements as they are extremely sensitive to errors. A mistyped number in a DATA statement can cause your machine to "lock up" (you'll have no control over the computer). If this happens, the only recourse is to turn your computer off then back on, erasing whatever was in memory. So be sure to *save a copy of your program before you run it.* If your computer crashes, you can always reload the program and look for the error.

Special Characters

Most of the programs listed in each issue contain special control characters. To facilitate typing in any programs from the GAZETTE, use the following listing conventions.

The most common type of control characters in our listings appear as words within braces: {DOWN} means to press the cursor down key; {5 SPACES} means to press the space bar five times.

To indicate that a key should be *shifted* (hold down the SHIFT key while pressing another key), the character is underlined. For example, $\underline{A}$ means hold down the SHIFT key and press A. You may see strange characters on your screen, but that's to be expected. If you find a number followed by an underlined key enclosed in braces (for example, {8 $\underline{A}$}), type the key as many times as indicated (in our example, enter eight SHIFTed A's).

If a key is enclosed in special brackets, Ɛ Ǝ, hold down the Commodore key (at the lower left corner of the keyboard) and press the indicated character.

Rarely, you'll see a single letter of the alphabet enclosed in braces. This can be entered on the Commodore 64 by pressing the CTRL key while typing the letter in braces. For example, {A} means to press CTRL-A.

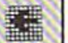
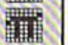
The Quote Mode

Although you can move the cursor around the screen with the CRSR keys, often a programmer will want to move the cursor under program control. This is seen in examples such as {LEFT} and {HOME} in the program listings. The only way the computer can tell the difference between direct and programmed cursor control is *the quote mode.*

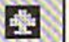
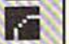
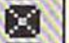
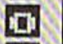
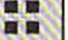
Once you press the quote key, you're in quote mode. This mode can be confusing if you mistype a character and cursor left to change it. You'll see a reverse video character (a graphics symbol for cursor left). In this case, you can use the DELete key to back up and edit the line. Type another quote and you're out of quote mode. If things really get confusing, you can exit quote mode simply by pressing RETURN. Then just cursor up to the mistyped line and fix it.

When You Read:	**Press:**		**See:**
{CLR}	SHIFT	CLR/HOME	
{HOME}		CLR/HOME	
{UP}	SHIFT	↑ CRSR ↓	
{DOWN}		↑ CRSR ↓	
{LEFT}	SHIFT	←CRSR→	
{RIGHT}		←CRSR→	
{RVS}	CTRL	9	
{OFF}	CTRL	0	
{BLK}	CTRL	1	
{WHT}	CTRL	2	
{RED}	CTRL	3	
{CYN}	CTRL	4	

When You Read:	**Press:**		**See:**
{PUR}	CTRL	5	
{GRN}	CTRL	6	
{BLU}	CTRL	7	
{YEL}	CTRL	8	
{ F1 }		f1	
{ F2 }	SHIFT	f1	
{ F3 }		f3	
{ F4 }	SHIFT	f3	
{ F5 }		f5	
{ F6 }	SHIFT	f5	
{ F7 }		f7	
{ F8 }	SHIFT	f7	

When You Read:	**Press:**		**See:**
←	←		
$\underline{\uparrow}$	SHIFT	↑	

For Commodore 64 Only

Ɛ 1 Ǝ	COMMODORE	1	
Ɛ 2 Ǝ	COMMODORE	2	
Ɛ 3 Ǝ	COMMODORE	3	
Ɛ 4 Ǝ	COMMODORE	4	
Ɛ 5 Ǝ	COMMODORE	5	
Ɛ 6 Ǝ	COMMODORE	6	
Ɛ 7 Ǝ	COMMODORE	7	
Ɛ 8 Ǝ	COMMODORE	8	

The Automatic Proofreader

Philip I. Nelson, Assistant Editor

"The Automatic Proofreader" helps you type in program listings for the 128, 64, Plus/4, 16, and VIC-20 and prevents nearly every kind of typing mistake.

Type in the Proofreader *exactly* as listed. Since the program can't check itself, type carefully to avoid mistakes. Don't omit any lines, even if they contain unfamiliar commands. After finishing, save a copy or two on disk or tape before running it. This is important because the Proofreader erases the BASIC portion of itself when you run it, leaving only the machine language portion in memory.

Next, type RUN and press RETURN. After announcing which computer it's running on, the Proofreader displays the message "Proofreader Active". Now you're ready to type in a BASIC program.

Every time you finish typing a line and press RETURN, the Proofreader displays a two-letter checksum in the upper-left corner of the screen. Compare this result with the two-letter checksum printed to the left of the line in the program listing. If the letters match, it's almost certain the line was typed correctly. If the letters don't match, check for your mistake and correct the line.

The Proofreader ignores spaces not enclosed in quotes, so you can omit or add spaces between keywords and still see a matching checksum. However, since spaces inside quotes are almost always significant, the Proofreader pays attention to them. For example, **10 PRINT"THIS IS BASIC"** will generate a different checksum than **10 PRINT"THIS ISBA SIC"**.

A common typing error is transposition—typing two successive characters in the wrong order, like PIRNT instead of PRINT or 64378 instead of 64738. The Proofreader is sensitive to the *position* of each character within the line and thus catches transposition errors.

The Proofreader does *not* accept keyword abbreviations (for example, ? instead of PRINT). If you prefer to use abbreviations, you can still check the line by LISTing it after typing it in, moving the cursor back to the line, and pressing RETURN. LISTing the line substitutes the full keyword for the abbreviation and allows the Proofreader to work properly. The same technique works for rechecking programs you've already typed in.

If you're using the Proofreader on the Commodore 128, Plus/4, or 16, *do not perform any GRAPHIC commands while the Proofreader is active.* When you perform a command like GRAPHIC 1, the computer moves everything at the start of BASIC program space—including the Proofreader—to another memory area, causing the Proofreader to crash. The same thing happens if you *run* any program with a GRAPHIC command while the Proofreader is in memory.

Though the Proofreader doesn't interfere with other BASIC operations, it's a good idea to disable it before running another program. However, the Proofreader is purposely difficult to dislodge: It's not affected by tape or disk operations, or by pressing RUN/STOP– RESTORE. The simplest way to disable it is to turn the computer off then on. A gentler method is to SYS to the computer's built-in reset routine (SYS 65341 for the 128, 64738 for the 64, 65526 for the Plus/4 and 16, and 64802 for the VIC). These reset routines erase any program in memory, so be sure to save the program you're typing in before entering the SYS command.

If you own a Commodore 64, you may already have wondered whether the Proofreader works with other programming utilities like "MetaBASIC." The answer is generally yes, *if you're using a 64 and activate the Proofreader after installing the other utility.* For example, first load and activate MetaBASIC, then load and run the Proofreader.

When using the Proofreader with another utility, you should disable *both* programs before running a BASIC program. While the Proofreader seems unaffected by most utilities, there's no way to promise that it will work with any and every combination of utilities you might want to use. The more utilities activated, the more fragile the system becomes.

The New Automatic Proofreader

```
10 VEC=PEEK(772)+256*PEEK(773)
   :LO=43:HI=44
20 PRINT "AUTOMATIC PROOFREADE
   R FOR ";:IF VEC=42364 THEN
   {SPACE}PRINT "C-64"
30 IF VEC=50556 THEN PRINT "VI
   C-20"
40 IF VEC=35158 THEN GRAPHIC C
   LR:PRINT "PLUS/4 & 16"
50 IF VEC=17165 THEN LO=45:HI=
   46:GRAPHIC CLR:PRINT"128"
60 SA=(PEEK(LO)+256*PEEK(HI))+
   6:ADR=SA
70 FOR J=0 TO 166:READ BYT:POK
   E ADR,BYT:ADR=ADR+1:CHK=CHK
   +BYT:NEXT
80 IF CHK<>20570 THEN PRINT "*
   ERROR* CHECK TYPING IN DATA
    STATEMENTS":END
90 FOR J=1 TO 5:READ RF,LF,HF:
   RS=SA+RF:HB=INT(RS/256):LB=
   RS-(256*HB)
100 CHK=CHK+RF+LF+HF:POKE SA+L
   F,LB:POKE SA+HF,HB:NEXT
110 IF CHK<>22054 THEN PRINT "
   *ERROR* RELOAD PROGRAM AND
   {SPACE}CHECK FINAL LINE":EN
   D
120 POKE SA+149,PEEK(772):POKE
    SA+150,PEEK(773)
130 IF VEC=17165 THEN POKE SA+
   14,22:POKE SA+18,23:POKESA+
   29,224:POKESA+139,224
140 PRINT CHR$(147);CHR$(17);"
   PROOFREADER ACTIVE":SYS SA
150 POKE HI,PEEK(HI)+1:POKE (P
   EEK(LO)+256*PEEK(HI))-1,0:N
   EW
160 DATA 120,169,73,141,4,3,16
   9,3,141,5,3
170 DATA 88,96,165,20,133,167,
   165,21,133,168,169
180 DATA 0,141,0,255,162,31,18
   1,199,157,227,3
190 DATA 202,16,248,169,19,32,
   210,255,169,18,32
200 DATA 210,255,160,0,132,180
   ,132,176,136,230,180
210 DATA 200,185,0,2,240,46,20
   1,34,208,8,72
220 DATA 165,176,73,255,133,17
   6,104,72,201,32,208
230 DATA 7,165,176,208,3,104,2
   08,226,104,166,180
240 DATA 24,165,167,121,0,2,13
   3,167,165,168,105
250 DATA 0,133,168,202,208,239
   ,240,202,165,167,69
260 DATA 168,72,41,15,168,185,
   211,3,32,210,255
270 DATA 104,74,74,74,74,168,1
   85,211,3,32,210
280 DATA 255,162,31,189,227,3,
   149,199,202,16,248
290 DATA 169,146,32,210,255,76
   ,86,137,65,66,67
300 DATA 68,69,70,71,72,74,75,
   77,80,81,82,83,88
310 DATA 13,2,7,167,31,32,151,
   116,117,151,128,129,167,136
   ,137
```

MLX Machine Language Entry Program For Commodore 64 and 128

Ottis R. Cowper, Technical Editor

"MLX" is a labor-saving utility that allows almost fail-safe entry of machine language programs. Included are versions for the Commodore 64 and 128.

Type in and save some copies of whichever version of MLX is appropriate for your computer (you'll want to use it to enter future ML programs from COMPUTE!'s GAZETTE). Program 1 is for the Commodore 64, and Program 2 is for the 128 (128 MLX can also be used to enter Commodore 64 ML programs for use in 64 mode). When you're ready to enter an ML program, load and run MLX. It asks you for a starting address and an ending address. These addresses appear in the article accompanying the MLX-format program listing you're typing.

If you're unfamiliar with machine language, the addresses (and all other values you enter in MLX) may appear strange. Instead of the usual decimal numbers you're accustomed to, these numbers are in *hexadecimal*—a base 16 numbering system commonly used by ML programmers. Hexadecimal—hex for short—includes the numerals 0–9 and the letters A–F. But don't worry—even if you know nothing about ML or hex, you should have no trouble using MLX.

After you enter the starting and ending addresses, you'll be offered the option of clearing the workspace. Choose this option if you're starting to enter a new listing. If you're continuing a listing that's partially typed from a previous session, don't choose this option.

A functions menu will appear. The first option in the menu is ENTER DATA. If you're just starting to type in a program, pick this. Press the E key, and type the first number in the first line of the program listing. If you've already typed in part of a program, type the line number where you left off typing at the end of the previous session (be sure to load the partially completed program before you resume entry). In any case, make sure the address you enter corresponds to the address of a line in the listing you are entering. Otherwise, you'll be unable to enter the data correctly. If you pressed E by mistake, you can return to the command menu by pressing RETURN alone when asked for the address. (You can get back to the menu from most options by pressing RETURN with no other input.)

Entering A Listing

Once you're in Enter mode, MLX prints the address for each program line for you. You then type in all nine numbers on that line, beginning with the first two-digit number after the colon (:). Each line represents eight data bytes and a checksum. Although an MLX-format listing appears similar to the "hex dump" listings from a machine language monitor program, the extra checksum number on the end allows MLX to check your typing. (Commodore 128 users *can* enter the data from an MLX listing using the built-in monitor if the rightmost column of data is omitted, but we recommend against it. It's much easier to let MLX do the proofreading and error checking for you.)

When you enter a line, MLX recalculates the checksum from the eight bytes and the address and compares this value to the number from the ninth column. If the values match, you'll hear a bell tone, the data will be added to the workspace area, and the prompt for the next line of data will appear. But if MLX detects a typing error, you'll hear a low buzz and see an error message. The line will then be redisplayed for editing.

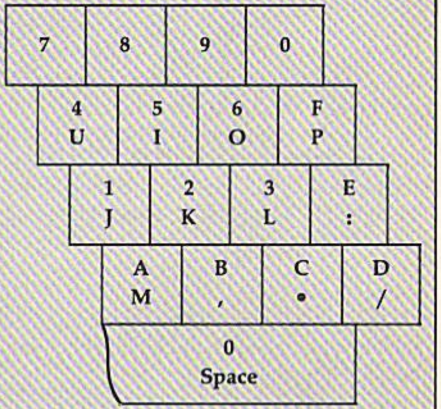
Invalid Characters Banned

Only a few keys are active while you're entering data, so you may have to unlearn some habits. You *do not* type spaces between the columns; MLX automatically inserts these for you. You *do not* press RETURN after typing the last number in a line; MLX automatically enters and checks the line after you type the last digit.

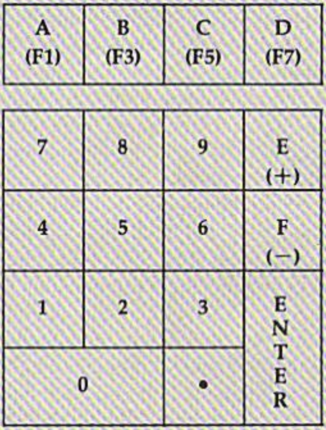
Only the numerals 0–9 and the letters A–F can be typed in. If you press any other key (with some exceptions noted below), you'll hear a warning buzz. To simplify typing, 128 MLX redefines the function keys and + and − keys on the numeric keypad so that you can enter data one-handed. (The 64 version incorporates the keypad modification from the March 1986 "Bug-Swatter" column, lines 485–487.) In either case, the keypad is active only while entering data. Addresses must be entered with the normal letter and number keys. The figures below show the keypad configurations for each version:

MLX checks for transposed characters. If you're supposed to type in A0 and instead enter 0A, MLX will catch your mistake. There is one error that can slip past MLX: Because of the checksum formula used, MLX won't notice if you accidentally type FF in place of 00, and vice versa. And there's a very slim chance that you could garble a line and still end up with a combination of characters that adds up to the proper checksum. However, these mistakes should not occur if you take reasonable care while entering data.

64 MLX Keypad



128 MLX Keypad



Editing Features

To correct typing mistakes before finishing a line, use the INST/DEL key to delete the character to the left of the cursor. (The cursor-left key also deletes.) If you mess up a line really badly, press CLR/HOME to start the line over. The RETURN key is also active, but only before any data is typed on a line. Pressing RETURN at this point returns you to the command menu. After you type a character of data, MLX disables RETURN until the cursor returns to the start of a line. Remember, you can press CLR/HOME to quickly get to a line number prompt.

More editing features are available when correcting lines in which MLX has detected an error. To make corrections in a line that MLX has redisplayed for editing, compare the line on the screen with the one printed in the listing, then move the cursor to the mistake and type the correct key. The cursor left and right keys provide the normal cursor controls. (The INST/DEL key now works as an alternative cursor-left key.) You cannot move left beyond the first character in the line. If you try to move beyond the rightmost character, you'll reenter the line. During editing, RETURN is active; pressing it tells MLX to recheck the line. You can press the CLR/HOME key to clear the entire line if you want to start from scratch, or if you want to get to a line number prompt to use RETURN to get back to the menu.

Display Data

The second menu choice, DISPLAY DATA, examines memory and shows the contents in the same format as the program listing (including the checksum). When you press D, MLX asks you for a starting address. Be sure that the starting address you give corresponds to a line number in the listing. Otherwise, the checksum display will be meaningless. MLX displays program lines until it reaches the end of the program, at which point the menu is redisplayed. You can pause the display by pressing the space bar. (MLX finishes printing the current line before halting.) Press space again to restart the display. To break out of the display and get back to the menu before the ending address is reached, press RETURN.

Other Menu Options

Two more menu selections let you save programs and load them back into the computer. These are SAVE FILE and LOAD FILE; their operation is quite straightforward. When you press S or L, MLX asks you for the filename. You'll then be asked to press either D or T to select disk or tape.

You'll notice the disk drive starting and stopping several times during a load or save (save only for the 128 version). Don't panic; this is normal behavior. MLX opens and reads from or writes to the file instead of using the usual LOAD and SAVE commands (128 MLX makes use of BLOAD). Disk users should also note that the drive prefix 0: is automatically added to the filename (line 750 in 64 MLX), so this should *not* be included when entering the name. This also precludes the use of @ for Save-with-Replace, so remember to give each version you save a different name. The 128 version makes up for this by giving you the option of scratching the existing file if you want to reuse a filename.

Remember that MLX saves the entire workspace area from the starting address to the ending address, so the save or load may take longer than you might expect if you've entered only a small amount of data from a long listing. When saving a partially completed listing, make sure to note the address where you stopped typing so you'll know where to resume entry when you reload.

MLX reports the standard disk or tape error messages if any problems are detected during the save or load. (Tape users should bear in mind that Commodore computers are never able to detect errors during a save to tape.) MLX also has three special load error messages: INCORRECT STARTING ADDRESS, which means the file you're trying to load does not have the starting address you specified when you ran MLX; LOAD ENDED AT *address*, which means the file you're trying to load ends before the ending address you specified when you started MLX; and TRUNCATED AT ENDING ADDRESS, which means the file you're trying to load extends beyond the ending address you specified when you started MLX. If you see one of these messages and feel certain that you've loaded the right file, exit and rerun MLX, being careful to enter the correct starting and ending addresses.

The 128 version also has a CATALOG DISK option so you can view the contents of the disk directory before saving or loading.

The QUIT menu option has the obvious effect—it stops MLX and enters BASIC. The RUN/STOP key is disabled, so the Q option lets you exit the program without turning off the computer. (Of course, RUN/STOP-RESTORE also gets you out.) You'll be asked for verification; press Y to exit to BASIC, or any other key to return to the menu. After quitting, you can type RUN again and reenter MLX without losing your data, as long as you don't use the clear workspace option.

The Finished Product

When you've finished typing all the data for an ML program and saved your work, you're ready to see the results. The instructions for loading and using the finished product vary from program to program. Some ML programs are designed to be loaded and run like BASIC programs, so all you need to type is LOAD *"filename"*,8 for disk (DLOAD *"filename"* on the 128) or LOAD *"filename"* for tape, and then RUN. Such programs will usually have a starting address of 0801 for the 64 or 1C01 for the 128. Other programs must be reloaded to specific addresses with a command such as LOAD *"filename"*,8,1 for disk (BLOAD *"filename"* on the 128) or LOAD *"filename"*,1,1 for tape, then started with a SYS to a particular memory address. On the Commodore 64, the most common starting address for such programs is 49152, which corresponds to MLX address C000. In either case, you should always refer to the article which accompanies the ML listing for information on loading and running the program.

An Ounce Of Prevention

By the time you finish typing in the data for a long ML program, you may have several hours invested in the project. Don't take chances—use our "Automatic Proofreader" to type the new MLX, and then test your copy *thoroughly* before first using it to enter any significant amount of data. Make sure all the menu options work as they should. Enter fragments of the program starting at several different addresses, then use the Display option to verify that the data has been entered correctly. And be sure to test the Save and Load options several times to ensure that you can recall your work from disk or tape. Don't let a simple typing error in the new MLX cost you several nights of hard work.

Program 1: MLX For Commodore 64

```
SS 10 REM VERSION 1.1: LINES 8
      30,950 MODIFIED, LINES 4
      85-487 ADDED
EK 100 POKE 56,50:CLR:DIM IN$,
       I,J,A,B,A$,B$,A(7),N$
DM 110 C4=48:C6=16:C7=7:Z2=2:Z
       4=254:Z5=255:Z6=256:Z7=
       127
CJ 120 FA=PEEK(45)+Z6*PEEK(46)
       :BS=PEEK(55)+Z6*PEEK(56
       ):H$="0123456789ABCDEF"
SB 130 R$=CHR$(13):L$="{LEFT}"
       :S$=" ":D$=CHR$(20):Z$=
       CHR$(0):T$="{13 RIGHT}"
CQ 140 SD=54272:FOR I=SD TO SD
       +23:POKE I,0:NEXT:POKE
       {SPACE}SD+24,15:POKE 78
       8,52
FC 150 PRINT"{CLR}"CHR$(142)CH
       R$(8):POKE 53280,15:POK
       E 53281,15
EJ 160 PRINT T$" {RED}{RVS}
       {2 SPACES}{8 @}
       {2 SPACES}"SPC(28)"
       {2 SPACES}{OFF}{BLU} ML
       X II {RED}{RVS}
       {2 SPACES}"SPC(28)"
       {12 SPACES}{BLU}"
FR 170 PRINT"{3 DOWN}
       {3 SPACES}COMPUTE!'S MA
       CHINE LANGUAGE EDITOR
       {3 DOWN}"
JB 180 PRINT"{BLK}STARTING ADD
```

```
        RESS{4}";:GOSUB300:SA=A
        D:GOSUB1040:IF F THEN18
        0
GF 190  PRINT"{BLK}{2 SPACES}EN
        DING ADDRESS{4}";:GOSUB
        300:EA=AD:GOSUB1030:IF
        {SPACE}F THEN190
KR 200  INPUT"{3 DOWN}{BLK}CLEA
        R WORKSPACE [Y/N]{4}";A
        $:IF LEFT$(A$,1)<>"Y"TH
        EN220
PG 210  PRINT"{2 DOWN}{BLU}WORK
        ING...";:FORI=BS TO BS+
        EA-SA+7:POKE I,0:NEXT:P
        RINT"DONE"
DR 220  PRINTTAB(10)"{2 DOWN}
        {BLK}{RVS} MLX COMMAND
        {SPACE}MENU {DOWN}{4}":
        PRINT T$"{RVS}E{OFF}NTE
        R DATA"
BD 230  PRINT T$"{RVS}D{OFF}ISP
        LAY DATA":PRINT T$"
        {RVS}L{OFF}OAD FILE"
JS 240  PRINT T$"{RVS}S{OFF}AVE
         FILE":PRINT T$"{RVS}Q
        {OFF}UIT{2 DOWN}{BLK}"
JH 250  GET A$:IF A$=N$ THEN250
HK 260  A=0:FOR I=1 TO 5:IF A$=
        MID$("EDLSQ",I,1)THEN A
        =I:I=5
FD 270  NEXT:ON A GOTO420,610,6
        90,700,280:GOSUB1060:GO
        TO250
EJ 280  PRINT"{RVS} QUIT ":INPU
        T"{DOWN}{4}ARE YOU SURE
         [Y/N]";A$:IF LEFT$(A$,
        1)<>"Y"THEN220
EM 290  POKE SD+24,0:END
JX 300  IN$=N$:AD=0:INPUTIN$:IF
        LEN(IN$)<>4THENRETURN
KF 310  B$=IN$:GOSUB320:AD=A:B$
        =MID$(IN$,3):GOSUB320:A
        D=AD*256+A:RETURN
PP 320  A=0:FOR J=1 TO 2:A$=MID
        $(B$,J,1):B=ASC(A$)-C4+
        (A$>"@")*C7:A=A*C6+B
JA 330  IF B<0 OR B>15 THEN AD=
        0:A=-1:J=2
GX 340  NEXT:RETURN
CH 350  B=INT(A/C6):PRINT MID$(
        H$,B+1,1);:B=A-B*C6:PRI
        NT MID$(H$,B+1,1);:RETU
        RN
RR 360  A=INT(AD/Z6):GOSUB350:A
        =AD-A*Z6:GOSUB350:PRINT
        ":";
BE 370  CK=INT(AD/Z6):CK=AD-Z4*
        CK+Z5*(CK>Z7):GOTO390
PX 380  CK=CK*Z2+Z5*(CK>Z7)+A
JC 390  CK=CK+Z5*(CK>Z5):RETURN
QS 400  PRINT"{DOWN}STARTING AT
        {4}";:GOSUB300:IF IN$<>
        N$ THEN GOSUB1030:IF F
        {SPACE}THEN400
EX 410  RETURN
HD 420  PRINT"{RVS} ENTER DATA
        {SPACE}":GOSUB400:IF IN
        $=N$ THEN220
JK 430  OPEN3,3:PRINT
SK 440  POKE198,0:GOSUB360:IF F
         THEN PRINT IN$:PRINT"
        {UP}{5 RIGHT}";
GC 450  FOR I=0 TO 24 STEP 3:B$
        =S$:FOR J=1 TO 2:IF F T
        HEN B$=MID$(IN$,I+J,1)
HA 460  PRINT"{RVS}"B$L$;:IF I<
        24THEN PRINT"{OFF}";
HD 470  GET A$:IF A$=N$ THEN470
FK 480  IF(A$>"/"ANDA$<":")OR(A
        $>"@"ANDA$<"G")THEN540
GS 485  A=-(A$="M")-2*(A$=",")-
        3*(A$=".")-4*(A$="/")-5
        *(A$="J")-6*(A$="K")
FX 486  A=A-7*(A$="L")-8*(A$=":
        ")-9*(A$="U")-10*(A$="I
        ")-11*(A$="O")-12*(A$="
        P")
CM 487  A=A-13*(A$=S$):IF A THE
        N A$=MID$("ABCD123E456F
        0",A,1):GOTO 540
MP 490  IF A$=R$ AND((I=0)AND(J
        =1)OR F)THEN PRINT B$;:
        J=2:NEXT:I=24:GOTO550
KC 500  IF A$="{HOME}" THEN PRI
        NT B$:J=2:NEXT:I=24:NEX
        T:F=0:GOTO440
MX 510  IF(A$="{RIGHT}")ANDF TH
        ENPRINT B$L$;:GOTO540
GK 520  IF A$<>L$ AND A$<>D$ OR
        ((I=0)AND(J=1))THEN GOS
        UB1060:GOTO470
HG 530  A$=L$+S$+L$:PRINT B$L$;
        :J=2-J:IF J THEN PRINT
        {SPACE}L$;:I=I-3
QS 540  PRINT A$;:NEXT J:PRINT
        {SPACE}S$;
PM 550  NEXT I:PRINT:PRINT"{UP}
        {5 RIGHT}";:INPUT#3,IN$
        :IF IN$=N$ THEN CLOSE3:
        GOTO220
QC 560  FOR I=1 TO 25 STEP3:B$=
        MID$(IN$,I):GOSUB320:IF
         I<25 THEN GOSUB380:A(I
        /3)=A
PK 570  NEXT:IF A<>CK THEN GOSU
        B1060:PRINT"{BLK}{RVS}
        {SPACE}ERROR: REENTER L
        INE {4}":F=1:GOTO440
HJ 580  GOSUB1080:B=BS+AD-SA:FO
        R I=0 TO 7:POKE B+I,A(I
        ):NEXT
QQ 590  AD=AD+8:IF AD>EA THEN C
        LOSE3:PRINT"{DOWN}{BLU}
        ** END OF ENTRY **{BLK}
        {2 DOWN}":GOTO700
GQ 600  F=0:GOTO440
QA 610  PRINT"{CLR}{DOWN}{RVS}
        {SPACE}DISPLAY DATA ":G
        OSUB400:IF IN$=N$ THEN2
        20
RJ 620  PRINT"{DOWN}{BLU}PRESS:
         {RVS}SPACE{OFF} TO PAU
        SE, {RVS}RETURN{OFF} TO
         BREAK{4}{DOWN}"
KS 630  GOSUB360:B=BS+AD-SA:FOR
        I=BTO B+7:A=PEEK(I):GOS
        UB350:GOSUB380:PRINT S$
        ;
CC 640  NEXT:PRINT"{RVS}";:A=CK
        :GOSUB350:PRINT
KH 650  F=1:AD=AD+8:IF AD>EA TH
        ENPRINT"{DOWN}{BLU}** E
        ND OF DATA **":GOTO220
KC 660  GET A$:IF A$=R$ THEN GO
        SUB1080:GOTO220
EQ 670  IF A$=S$ THEN F=F+1:GOS
        UB1080
AD 680  ONFGOTO630,660,630
CM 690  PRINT"{DOWN}{RVS} LOAD
        {SPACE}DATA ":OP=1:GOTO
        710
PC 700  PRINT"{DOWN}{RVS} SAVE
        {SPACE}FILE ":OP=0
RX 710  IN$=N$:INPUT"{DOWN}FILE
        NAME{4}";IN$:IF IN$=N$
        {SPACE}THEN220
PR 720  F=0:PRINT"{DOWN}{BLK}
        {RVS}T{OFF}APE OR {RVS}
        D{OFF}ISK: {4}";
FP 730  GET A$:IF A$="T"THEN PR
        INT"T{DOWN}":GOTO880
HQ 740  IF A$<>"D"THEN730
HH 750  PRINT"D{DOWN}":OPEN15,8
        ,15,"I0:":B=EA-SA:IN$="
        0:"+IN$:IF OP THEN810
SQ 760  OPEN 1,8,8,IN$+",P,W":G
        OSUB860:IF A THEN220
FJ 770  AH=INT(SA/256):AL=SA-(A
        H*256):PRINT#1,CHR$(AL)
        ;CHR$(AH);
PE 780  FOR I=0 TO B:PRINT#1,CH
        R$(PEEK(BS+I));:IF ST T
        HEN800
FC 790  NEXT:CLOSE1:CLOSE15:GOT
        O940
GS 800  GOSUB1060:PRINT"{DOWN}
        {BLK}ERROR DURING SAVE:
        {4}":GOSUB860:GOTO220
MA 810  OPEN 1,8,8,IN$+",P,R":G
        OSUB860:IF A THEN220
GE 820  GET#1,A$,B$:AD=ASC(A$+Z
        $)+256*ASC(B$+Z$):IF AD
        <>SA THEN F=1:GOTO850
RX 830  FOR I=0 TO B:GET#1,A$:P
        OKE BS+I,ASC(A$+Z$):IF(
        I<>B)AND ST THEN F=2:AD
        =I:I=B
FA 840  NEXT:IF ST<>64 THEN F=3
FQ 850  CLOSE1:CLOSE15:ON ABS(F
        >0)+1 GOTO960,970
SA 860  INPUT#15,A,A$:IF A THEN
         CLOSE1:CLOSE15:GOSUB10
        60:PRINT"{RVS}ERROR: "A
        $
GQ 870  RETURN
EJ 880  POKE183,PEEK(FA+2):POKE
        187,PEEK(FA+3):POKE188,
        PEEK(FA+4):IFOP=0THEN92
        0
HJ 890  SYS 63466:IF(PEEK(783)A
        ND1)THEN GOSUB1060:PRIN
        T"{DOWN}{RVS} FILE NOT
        {SPACE}FOUND ":GOTO690
CS 900  AD=PEEK(829)+256*PEEK(8
        30):IF AD<>SA THEN F=1:
        GOTO970
SC 910  A=PEEK(831)+256*PEEK(83
        2)-1:F=F-2*(A<EA)-3*(A>
        EA):AD=A-AD:GOTO930
KM 920  A=SA:B=EA+1:GOSUB1010:P
        OKE780,3:SYS 63338
JF 930  A=BS:B=BS+(EA-SA)+1:GOS
        UB1010:ON OP GOTO950:SY
        S 63591
AE 940  GOSUB1080:PRINT"{BLU}**
         SAVE COMPLETED **":GOT
        O220
XP 950  POKE147,0:SYS 63562:IF
        {SPACE}ST>0 THEN970
FR 960  GOSUB1080:PRINT"{BLU}**
         LOAD COMPLETED **":GOT
        O220
DP 970  GOSUB1060:PRINT"{BLK}
        {RVS}ERROR DURING LOAD:
        {DOWN}{4}":ON F GOSUB98
        0,990,1000:GOTO220
PP 980  PRINT"INCORRECT STARTIN
        G ADDRESS (";:GOSUB360:
        PRINT")":RETURN
GR 990  PRINT"LOAD ENDED AT ";:
        AD=SA+AD:GOSUB360:PRINT
        D$:RETURN
FD 1000 PRINT"TRUNCATED AT END
        ING ADDRESS":RETURN
RX 1010 AH=INT(A/256):AL=A-(AH
        *256):POKE193,AL:POKE1
        94,AH
FF 1020 AH=INT(B/256):AL=B-(AH
        *256):POKE174,AL:POKE1
        75,AH:RETURN
FX 1030 IF AD<SA OR AD>EA THEN
        1050
HA 1040 IF(AD>511 AND AD<40960
        )OR(AD>49151 AND AD<53
        248)THEN GOSUB1080:F=0
        :RETURN
HC 1050 GOSUB1060:PRINT"{RVS}
        {SPACE}INVALID ADDRESS
         {DOWN}{BLK}":F=1:RETU
        RN
AR 1060 POKE SD+5,31:POKE SD+6
        ,208:POKE SD,240:POKE
        {SPACE}SD+1,4:POKE SD+
        4,33
DX 1070 FOR S=1 TO 100:NEXT:GO
        TO1090
PF 1080 POKE SD+5,8:POKE SD+6,
        240:POKE SD,0:POKE SD+
        1,90:POKE SD+4,17
AC 1090 FOR S=1 TO 100:NEXT:PO
        KE SD+4,0:POKE SD,0:PO
        KE SD+1,0:RETURN
```

Program 2: MLX For Commodore 128

```
AE 100 TRAP 960:POKE 4627,128:
       DIM NL$,A(7)
XP 110 Z2=2:Z4=254:Z5=255:Z6=2
       56:Z7=127:BS=256*PEEK(4
       627):EA=65280
FB 120 BE$=CHR$(7):RT$=CHR$(13
       ):DL$=CHR$(20):SP$=CHR$
       (32):LF$=CHR$(157)
KE 130 DEF FNHB(A)=INT(A/256):
       DEF FNLB(A)=A-FNHB(A)*2
       56:DEF FNAD(A)=PEEK(A)+
       256*PEEK(A+1)
JB 140 KEY 1,"A":KEY 3,"B":KEY
        5,"C":KEY 7,"D":VOL 15
       :IF RGR(0)=5 THEN FAST
FJ 150 PRINT"{CLR}"CHR$(142);C
       HR$(8):COLOR 0,15:COLOR
        4,15:COLOR 6,15
GQ 160 PRINT TAB(12)"{RED}
       {RVS}{2 SPACES}E9 @3
       {2 SPACES}"RT$;TAB(12)"
       {RVS}{2 SPACES}{OFF}
       {BLU} 128 MLX {RED}
       {RVS}{2 SPACES}"RT$;TAB
       (12)"{RVS}{13 SPACES}
       {BLU}"
FE 170 PRINT"{2 DOWN}
       {3 SPACES}COMPUTE!'S MA
       CHINE LANGUAGE EDITOR
       {2 DOWN}"
DK 180 PRINT"{BLK}STARTING ADD
       RESSE43";:GOSUB 260:IF
       {SPACE}AD THEN SA=AD:EL
       SE 180
FH 190 PRINT"{BLK}{2 SPACES}EN
       DING ADDRESSE43";:GOSUB
        260:IF AD THEN EA=AD:E
       LSE 190
MF 200 PRINT"{DOWN}{BLK}CLEAR
       {SPACE}WORKSPACE [Y/N]?
       E43":GETKEY A$:IF A$<>"
       Y" THEN 220
QH 210 PRINT"{DOWN}{BLU}WORKIN
       G...";:BANK 0:FOR A=BS
       {SPACE}TO BS+(EA-SA)+7:
       POKE A,0:NEXT A:PRINT"D
       ONE"
DC 220 PRINT TAB(10)"{DOWN}
       {BLK}{RVS} MLX COMMAND
       {SPACE}MENU E43{DOWN}":
       PRINT TAB(13)"{RVS}E
       {OFF}NTER DATA"RT$;TAB(
       13)"{RVS}D{OFF}ISPLAY D
       ATA"RT$;TAB(13)"{RVS}L
       {OFF}OAD FILE"
HB 230 PRINT TAB(13)"{RVS}S
```

```
       {OFF}AVE FILE"RT$;TAB(1
       3)"{RVS}C{OFF}ATALOG DI
       SK"RT$;TAB(13)"{RVS}Q
       {OFF}UIT{DOWN}{BLK}"
AP 240 GETKEY A$:A=INSTR("EDLS
       CQ",A$):ON A GOTO 340,5
       50,640,650,930,940:GOSU
       B 950:GOTO 240
SX 250 PRINT"STARTING AT";:GOS
       UB 260:IF(AD<>0)OR(A$=N
       L$)THEN RETURN:ELSE 250
BG 260 A$=NL$:INPUT A$:IF LEN(
       A$)=4 THEN AD=DEC(A$)
PP 270 IF AD=0 THEN BEGIN:IF A
       $<>NL$ THEN 300:ELSE RE
       TURN:BEND
MA 280 IF AD<SA OR AD>EA THEN
       {SPACE}300
PM 290 IF AD>511 AND AD<65280
       {SPACE}THEN PRINT BE$;:
       RETURN
SQ 300 GOSUB 950:PRINT"{RVS} I
       NVALID ADDRESS {DOWN}
       {BLK}":AD=0:RETURN
RD 310 CK=FNHB(AD):CK=AD-Z4*CK
       +Z5*(CK>Z7):GOTO 330
DD 320 CK=CK*Z2+Z5*(CK>Z7)+A
AH 330 CK=CK+Z5*(CK>Z5):RETURN
QD 340 PRINT BE$;"{RVS} ENTER
       {SPACE}DATA ":GOSUB 250
       :IF A$=NL$ THEN 220
JA 350 BANK 0:PRINT:F=0:OPEN 3
       ,3
BR 360 GOSUB 310:PRINT HEX$(AD
       )+":";:IF F THEN PRINT
       {SPACE}L$:PRINT"{UP}
       {5 RIGHT}";
QA 370 FOR I=0 TO 24 STEP 3:B$
       =SP$:FOR J=1 TO 2:IF F
       {SPACE}THEN B$=MID$(L$,
       I+J,1)
PS 380 PRINT"{RVS}"B$+LF$;:IF
       {SPACE}I<24 THEN PRINT"
       {OFF}";
RC 390 GETKEY A$:IF (A$>"/" AN
       D A$<":") OR(A$>"@" AND
        A$<"G") THEN 470
AC 400 IF A$="+" THEN A$="E":G
       OTO 470
QB 410 IF A$="-" THEN A$="F":G
       OTO 470
FB 420 IF A$=RT$ AND ((I=0) AN
       D (J=1) OR F) THEN PRIN
       T B$;:J=2:NEXT:I=24:GOT
       O 480
RD 430 IF A$="{HOME}" THEN PRI
       NT B$:J=2:NEXT:I=24:NEX
       T:F=0:GOTO 360
XB 440 IF (A$="{RIGHT}") AND F
        THEN PRINT B$+LF$;:GOT
       O 470
JP 450 IF A$<>LF$ AND A$<>DL$
       {SPACE}OR ((I=0) AND (J
       =1)) THEN GOSUB 950:GOT
       O 390
PS 460 A$=LF$+SP$+LF$:PRINT B$
       +LF$;:J=2-J:IF J THEN P
       RINT LF$;:I=I-3
GB 470 PRINT A$;:NEXT J:PRINT
       {SPACE}SP$;
HA 480 NEXT I:PRINT:PRINT"{UP}
       {5 RIGHT}";:L$="
       {27 SPACES}"
DP 490 FOR I=1 TO 25 STEP 3:GE
       T#3,A$,B$:IF A$=SP$ THE
       N I=25:NEXT:CLOSE 3:GOT
       O 220
BA 500 A$=A$+B$:A=DEC(A$):MID$
       (L$,I,2)=A$:IF I<25 THE
       N GOSUB 320:A(I/3)=A:GE
       T#3,A$
```

```
AR 510 NEXT I:IF A<>CK THEN GO
       SUB 950:PRINT:PRINT"
       {RVS} ERROR: REENTER LI
       NE ":F=1:GOTO 360
DX 520 PRINT BE$:B=BS+AD-SA:FO
       R I=0 TO 7:POKE B+I,A(I
       ):NEXT I
XB 530 F=0:AD=AD+8:IF AD<=EA T
       HEN 360
CA 540 CLOSE 3:PRINT"{DOWN}
       {BLU}** END OF ENTRY **
       {BLK}{2 DOWN}":GOTO 650
MC 550 PRINT BE$;"{CLR}{DOWN}
       {RVS} DISPLAY DATA ":GO
       SUB 250:IF A$=NL$ THEN
       {SPACE}220
JF 560 BANK 0:PRINT"{DOWN}
       {BLU}PRESS: {RVS}SPACE
       {OFF} TO PAUSE, {RVS}RE
       TURN{OFF} TO BREAKE43
       {DOWN}"
XA 570 PRINT HEX$(AD)+":";:GOS
       UB 310:B=BS+AD-SA
DJ 580 FOR I=B TO B+7:A=PEEK(I
       ):PRINT RIGHT$(HEX$(A),
       2);SP$;:GOSUB 320:NEXT
       {SPACE}I
XB 590 PRINT"{RVS}";RIGHT$(HEX
       $(CK),2)
GR 600 F=1:AD=AD+8:IF AD>EA TH
       EN PRINT"{BLU}** END OF
        DATA **":GOTO 220
EB 610 GET A$:IF A$=RT$ THEN P
       RINT BE$:GOTO 220
QK 620 IF A$=SP$ THEN F=F+1:PR
       INT BE$;
XS 630 ON F GOTO 570,610,570
RF 640 PRINT BE$"{DOWN}{RVS} L
       OAD DATA ":OP=1:GOTO 66
       0
BP 650 PRINT BE$"{DOWN}{RVS} S
       AVE FILE ":OP=0
DM 660 F=0:F$=NL$:INPUT"FILENA
       ME E43";F$:IF F$=NL$ THE
       N 220
RF 670 PRINT"{DOWN}{BLK}{RVS}T
       {OFF}APE OR {RVS}D{OFF}
       ISK: E43";
SQ 680 GETKEY A$:IF A$="T" THE
       N 850:ELSE IF A$<>"D" T
       HEN 680
SP 690 PRINT"DISK{DOWN}":IF OP
        THEN 760
EH 700 DOPEN#1,(F$+",P"),W:IF
       {SPACE}DS THEN A$=D$:GO
       TO 740
JH 710 BANK 0:POKE BS-2,FNLB(S
       A):POKE BS-1,FNHB(SA):P
       RINT"SAVING ";F$:PRINT
MC 720 FOR A=BS-2 TO BS+EA-SA:
       PRINT#1,CHR$(PEEK(A));:
       IF ST THEN A$="DISK WRI
       TE ERROR":GOTO 750
GC 730 NEXT A:CLOSE 1:PRINT"
       {BLU}** SAVE COMPLETED
       {SPACE}WITHOUT ERRORS *
       *":GOTO 220
RA 740 IF DS=63 THEN BEGIN:CLO
       SE 1:INPUT"{BLK}REPLACE
        EXISTING FILE [Y/N]E43
       ";A$:IF A$="Y" THEN SCR
       ATCH(F$):PRINT:GOTO 700
       :ELSE PRINT"{BLK}":GOTO
        660:BEND
GA 750 CLOSE 1:GOSUB 950:PRINT
       "{BLK}{RVS} ERROR DURIN
       G SAVE: E43":PRINT A$:G
       OTO 220
FD 760 DOPEN#1,(F$+",P"):IF DS
        THEN A$=DS$:F=4:CLOSE
       {SPACE}1:GOTO 790
```

```
PX 770 GET#1,A$,B$:CLOSE 1:AD=
       ASC(A$)+256*ASC(B$):IF
       {SPACE}AD<>SA THEN F=1:
       GOTO 790
KB 780 PRINT"LOADING ";F$:PRIN
       T:BLOAD(F$),B0,P(BS):AD
       =SA+FNAD(174)-BS-1:F=-2
       *(AD<EA)-3*(AD>EA)
RQ 790 IF F THEN 800:ELSE PRIN
       T"{BLU}** LOAD COMPLETE
       D WITHOUT ERRORS **":GO
       TO 220
ER 800 GOSUB 950:PRINT"{BLK}
       {RVS} ERROR DURING LOAD
       : {4}":ON F GOSUB 810,8
       20,830,840:GOTO220
QJ 810 PRINT"INCORRECT STARTIN
       G ADDRESS (";HEX$(AD);"
       )":RETURN
DP 820 PRINT"LOAD ENDED AT ";H
       EX$(AD):RETURN
EB 830 PRINT"TRUNCATED AT ENDI
       NG ADDRESS ("HEX$(EA)")
       ":RETURN
FP 840 PRINT"DISK ERROR ";A$:R
       ETURN
KS 850 PRINT"TAPE":AD=POINTER(
       F$):BANK 1:A=PEEK(AD):A
       L=PEEK(AD+1):AH=PEEK(AD
       +2)
XX 860 BANK 15:SYS DEC("FF68")
       ,0,1:SYS DEC("FFBA"),1,
       1,0:SYS DEC("FFBD"),A,A
       L,AH:SYS DEC("FF90"),12
       8:IF OP THEN 890
FG 870 PRINT:A=SA:B=EA+1:GOSUB
        920:SYS DEC("E919"),3:
       PRINT"SAVING ";F$
AB 880 A=BS:B=BS+(EA-SA)+1:GOS
       UB 920:SYS DEC("EA18"):
       PRINT"{DOWN}{BLU}** TAP
       E SAVE COMPLETED **":GO
       TO 220
CP 890 SYS DEC("E99A"):PRINT:I
       F PEEK(2816)=5 THEN GOS
       UB 950:PRINT"{DOWN}
       {BLK}{RVS} FILE NOT FOU
       ND ":GOTO 220
GQ 900 PRINT"LOADING ...{DOWN}
       ":AD=FNAD(2817):IF AD<>
       SA THEN F=1:GOTO 800:EL
       SE AD=FNAD(2819)-1:F=-2
       *(AD<EA)-3*(AD>EA)
JD 910 A=BS:B=BS+(EA-SA)+1:GOS
       UB 920:SYS DEC("E9FB"):
       IF ST>0 THEN 800:ELSE 7
       90
XB 920 POKE193,FNLB(A):POKE194
       ,FNHB(A):POKE 174,FNLB(
       B):POKE 175,FNHB(B):RET
       URN
CP 930 CATALOG:PRINT"{DOWN}
       {BLU}** PRESS ANY KEY F
       OR MENU **":GETKEY A$:G
       OTO 220
MM 940 PRINT BE$"{RVS} QUIT
       {4}";RT$;"ARE YOU SURE
       {SPACE}[Y/N]?":GETKEY A
       $:IF A$<>"Y" THEN 220:E
       LSE PRINT"{CLR}":BANK 1
       5:END
JE 950 SOUND 1,500,10:RETURN
AF 960 IF ER=14 AND EL=260 THE
       N RESUME 300
MK 970 IF ER=14 AND EL=500 THE
       N RESUME NEXT
KJ 980 IF ER=4 AND EL=780 THEN
        F=4:A$=DS$:RESUME 800
DQ 990 IF ER=30 THEN RESUME:EL
       SE PRINT ERR$(ER);" ERR
       OR IN LINE";EL
```

Address Cataloger

See instructions in article on page 57 before typing in.

BEFORE TYPING . . .

Before typing in programs, please refer to "How To Type In COMPUTE!'s GAZETTE Programs," which appears before the Program Listings.

```
0801:FF FF 0A 00 9E 32 30 36 A6
0809:31 00 00 00 A9 36 85 01 E3
0811:20 92 0D 20 BB 12 A5 8B 76
0819:0A AA BD 2D 08 8D 28 08 32
0821:BD 2E 08 8D 29 08 20 FF 1F
0829:FF 4C 14 08 A3 08 CF 09 35
0831:4B 0A 3D 08 4A 08 0D 0B 29
0839:E7 0B 5E 0D 20 C5 10 20 F4
0841:70 0F A9 00 85 04 4C 8E E5
0849:0E A9 00 2C A9 01 85 39 23
0851:20 C5 10 20 FA 0D A9 01 47
0859:85 04 20 8E 0E 20 1A 0E 4D
0861:A9 FF 85 FB 20 25 0E A5 0E
0869:39 F0 01 60 E0 E6 D0 CC 89
0871:20 93 08 A2 0B A0 10 18 B4
0879:20 F0 FF A9 89 A0 08 20 6F
0881:FB 0A 20 D5 0A E6 FB 60 B7
0889:1F 4E 4F 20 4D 41 54 43 04
0891:48 00 A9 0F 8D 20 D0 8D 08
0899:21 D0 8D 86 02 A9 93 4C B2
08A1:40 14 A9 00 85 8B 20 C4 6B
08A9:08 B0 17 A9 00 A2 70 A0 73
08B1:17 20 D5 FF A5 0C C9 01 02
08B9:F0 05 20 05 0A F0 03 20 12
08C1:D5 0A 60 A2 05 BD FF 09 9D
08C9:9D C0 02 CA 10 F7 20 93 F9
08D1:08 A2 05 A0 00 20 F0 FF 9B
08D9:A9 B8 A0 09 20 FB 0A A9 40
08E1:08 85 0C 20 E4 FF C9 44 D9
08E9:F0 0C C9 54 D0 F5 A9 01 A6
08F1:85 0C A9 00 85 8B A9 A6 51
08F9:A0 09 20 FB 0A 20 97 09 69
0901:A0 00 84 F7 20 E4 FF A4 AC
0909:F7 C9 0D F0 27 C9 14 F0 B3
0911:1C C9 20 90 ED C9 5B B0 AE
0919:E9 99 C6 02 C8 C0 0C F0 D1
0921:13 20 40 14 20 97 09 8C 0C
0929:3C 03 4C 03 09 C0 00 F0 10
0931:D1 88 10 ED C0 00 F0 5C 73
0939:20 46 0A 20 43 0A A5 8B 49
0941:F0 3C 98 48 A9 02 A2 CD DA
0949:A0 09 20 BD FF A9 0F A8 3B
0951:A2 08 20 BA FF 20 C0 FF 68
0959:20 05 0A A9 0F 20 C3 FF 19
0961:68 18 69 06 A2 C0 A0 02 96
0969:20 BD FF A9 0F A8 A2 08 FD
0971:20 BA FF 20 C0 FF 20 05 8F
0979:0A A9 0F 20 C3 FF A9 01 51
0981:A8 A6 0C 20 BA FF A5 F7 2E
0989:18 69 03 A2 C3 A0 02 20 51
0991:BD FF 18 60 38 60 98 48 48
0999:A9 A3 A0 09 20 FB 0A 68 7B
09A1:A8 60 AF 9D 00 1F 45 4E 45
09A9:54 45 52 20 46 49 4C 45 B8
09B1:4E 41 4D 45 3A 20 00 1C A7
09B9:28 54 29 41 50 45 20 4F 55
09C1:52 20 28 44 29 49 53 4B AE
09C9:0D 0D 0D 00 49 30 A9 01 A6
09D1:85 8B 20 C4 08 B0 26 20 49
09D9:C4 0B E8 20 60 10 A6 02 C2
09E1:A4 03 A9 70 85 02 A9 17 E1
09E9:85 03 A9 02 20 D8 FF A5 DE
09F1:0C C9 01 F0 05 20 05 0A 68
09F9:F0 03 20 D5 0A 60 53 30 4F
0A01:3A A6 A6 A6 A5 90 F0 39 A5
0A09:20 43 0A 20 43 0A A9 0F E5
0A11:A2 08 A8 20 BA FF A9 00 B8
0A19:20 BD FF 20 C0 FF A2 0F 09
0A21:20 C6 FF 20 CF FF 48 20 28
0A29:40 14 68 C9 0D D0 F4 A9 4B
0A31:02 20 C3 FF A9 0F 20 C3 54
0A39:FF 20 CC FF 20 43 0A A9 BA
0A41:01 60 A9 0D 2C A9 20 4C 88
0A49:40 14 A9 93 20 40 14 A9 C4
0A51:1F 20 40 14 A9 02 A2 08 E8
0A59:A0 00 20 BA FF A2 CE A0 36
0A61:0A A9 08 20 BD FF 20 C0 D6
0A69:FF A2 02 20 C6 FF 20 CF AE
0A71:FF 20 05 0A D0 38 20 CF 46
0A79:FF 20 CF FF 85 F8 20 CF AF
0A81:FF 05 F8 F0 29 20 CF FF 6E
0A89:85 F8 20 CF FF A6 F8 20 4C
0A91:BA 0A 20 CF FF C9 A6 F0 EB
0A99:F9 C9 00 F0 06 20 40 14 71
0AA1:4C 93 0A AD 8D 02 D0 FB EE
0AA9:20 43 0A 4C 7A 0A A9 02 F5
0AB1:20 C3 FF 20 CC FF 4C D5 9D
0AB9:0A 48 A9 37 85 01 68 20 AE
0AC1:CD BD 20 46 0A 20 46 0A FB
0AC9:A9 36 85 01 60 24 30 3A 2F
0AD1:A6 A6 A6 2A A2 18 A0 0E 1F
0AD9:18 20 F0 FF A9 EA A0 0A 64
0AE1:20 FB 0A 20 E4 FF F0 FB 4D
0AE9:60 12 1C 50 52 45 53 53 DC
0AF1:20 41 4E 59 20 4B 45 59 D7
0AF9:92 00 85 05 84 06 A0 FF D5
0B01:C8 B1 05 F0 06 20 40 14 DC
0B09:4C 01 0B 60 20 C4 0B E0 F7
0B11:01 B0 01 60 86 8D A9 00 B7
0B19:85 8B AA EE 20 D0 A9 70 21
0B21:85 02 A9 17 85 03 A5 02 A6
0B29:85 05 18 69 C8 85 02 A5 E2
0B31:03 85 06 69 00 85 03 A0 3E
0B39:FF C8 C0 25 F0 1F B1 02 55
0B41:D1 05 F0 F5 B0 17 A0 C7 E9
0B49:B1 02 85 F7 B1 05 91 02 AF
0B51:A5 F7 91 05 88 C0 FF D0 D2
0B59:EF A9 01 85 8B E8 E4 8D A1
0B61:D0 C4 C6 8D F0 04 A5 8B 31
0B69:D0 AC 60 A6 FB E0 E5 F0 A9
0B71:1A 20 60 10 A5 02 85 C1 AB
0B79:A5 03 85 C2 E8 20 60 10 98
0B81:A5 02 85 BD A5 03 85 BE 7A
0B89:20 66 13 20 92 0B 4C 81 88
0B91:10 A2 E5 4C CA 0D 20 C4 69
0B99:0B E0 E5 F0 25 A6 FB E0 D5
0BA1:E5 F0 1F 20 60 10 A5 02 5D
0BA9:85 BD A5 03 85 BE E8 20 EF
0BB1:60 10 A5 02 85 C1 A5 03 52
0BB9:85 C2 20 A6 13 A6 FB 4C 29
0BC1:D1 0F 60 A2 FF E8 E0 E6 07
0BC9:F0 19 20 60 10 A0 C8 88 C5
0BD1:C0 FF F0 F1 B1 02 C9 A0 4F
0BD9:F0 F5 C9 AD F0 F1 86 F7 4E
0BE1:4C C6 0B A6 F7 60 A9 00 30
0BE9:85 3A A2 4C A0 12 A9 04 0F
0BF1:20 C1 12 A5 8B C9 03 D0 7F
0BF9:01 60 85 28 A2 93 A0 12 92
0C01:A9 03 20 C1 12 A5 8B F0 FD
0C09:1B C9 01 F0 01 60 20 C4 DE
0C11:0B E8 86 8F A2 00 20 49 51
0C19:0C 20 E1 FF F0 05 E8 E4 CD
0C21:8F D0 F3 60 20 4D 08 E0 E0
0C29:E6 F0 1C 20 81 10 A6 FB 0C
0C31:20 49 0C 20 25 0E E0 E6 39
0C39:F0 0D 20 81 10 A6 FB 20 5C
0C41:49 0C 20 E1 FF D0 EC 60 A0
0C49:8A 48 20 60 10 A9 00 85 6F
0C51:8D A5 28 0A AA BD 3A 14 14
0C59:8D 5B 0D BD 3B 14 8D 5C 2E
0C61:0D A9 01 A0 00 A2 04 20 47
```

```
0C69:BA FF 20 C0 FF A2 01 20 9B
0C71:C9 FF A5 28 C9 02 F0 16 F3
0C79:A5 3A C9 38 90 10 49 FF 07
0C81:18 69 43 AA 20 43 0A CA FF
0C89:D0 FA A9 01 85 3A A2 FF 68
0C91:E8 20 5A 0D C9 FD D0 03 2D
0C99:4C 22 0D C9 FC D0 09 A9 85
0CA1:32 38 E5 8D 85 F7 D0 0A 2E
0CA9:C9 FF D0 0F E8 20 5A 0D 3B
0CB1:85 F7 20 46 0A C6 F7 D0 1F
0CB9:F9 F0 D5 C9 FE D0 11 E8 A8
0CC1:20 5A 0D 85 F7 F0 C9 20 B1
0CC9:43 0A C6 F7 D0 F9 F0 C0 6F
0CD1:C9 0A 90 06 20 40 14 4C 3A
0CD9:91 0C A8 B9 83 0E 48 B9 0D
0CE1:84 0E 85 F7 68 A8 20 40 56
0CE9:0D A5 8D 18 65 8C 85 8D 1B
0CF1:E6 8C C8 C4 8C D0 0A E8 AA
0CF9:20 5A 0D 10 01 CA 4C 91 B8
0D01:0C B1 02 C9 AD F0 EB C9 3D
0D09:A0 F0 E7 88 C8 C4 8C F0 98
0D11:ED B1 02 29 3F C9 1B B0 69
0D19:02 09 40 20 40 14 4C 0D 78
0D21:0D A5 28 C9 02 F0 0D A0 5B
0D29:32 A9 C3 20 40 14 88 D0 75
0D31:F8 20 43 0A A9 01 20 C3 2E
0D39:FF 20 CC FF 68 AA 60 98 3C
0D41:48 C8 84 8C 88 E6 F7 C8 A3
0D49:C4 F7 D0 03 68 A8 60 B1 66
0D51:02 C9 A0 F0 F2 84 8C D0 95
0D59:EE BD FF FF 60 A9 37 85 F7
0D61:01 00 A6 FB 20 60 10 A2 D5
0D69:00 BD 96 11 85 05 BD 97 2A
0D71:11 85 06 A0 00 B1 05 10 21
0D79:05 91 02 C8 10 F7 98 18 F0
0D81:65 02 85 02 A5 03 69 00 AB
0D89:85 03 E8 E8 E0 14 D0 D9 A5
0D91:60 A9 8E 20 40 14 A9 08 C7
0D99:20 40 14 A9 00 85 FE 85 8A
0DA1:FB A9 14 85 FA A9 80 8D 0C
0DA9:8A 02 78 A9 E3 8D 14 03 B3
0DB1:A9 0D 8D 15 03 58 A9 70 24
0DB9:85 02 A9 17 85 03 A2 E5 21
0DC1:20 CA 0D CA E0 FF D0 F8 8E
0DC9:60 20 60 10 A0 C7 A9 A0 41
0DD1:91 02 88 C0 FF D0 F9 A9 33
0DD9:AD A0 81 91 02 A0 85 91 6B
0DE1:02 60 A5 FE F0 10 C6 FA 0A
0DE9:D0 0C A9 14 85 FA A0 00 3F
0DF1:B1 FC 49 80 91 FC 4C 31 9F
0DF9:EA A9 00 85 FE 85 FF A8 03
0E01:B1 FC 09 80 91 FC 20 0F 2E
0E09:0E A9 01 85 FE 60 AD 96 7A
0E11:11 85 FC AD 97 11 85 FD 9B
0E19:60 A9 34 85 02 A9 03 85 F0
0E21:03 4C 68 0D A6 FB E8 20 C6
0E29:60 10 A0 09 86 62 B9 83 D2
0E31:0E 85 8E AA B9 84 0E 85 B3
0E39:8F 84 61 E8 E4 8F F0 36 76
0E41:BD 34 03 C9 A0 F0 F4 86 7F
0E49:8D A4 8E A6 8D C8 C4 8F 3A
0E51:F0 1C BD 34 03 D1 02 D0 1C
0E59:F4 84 8E C8 E8 E4 8F F0 5A
0E61:15 BD 34 03 C9 A0 F0 F3 D4
0E69:D1 02 D0 DD F0 ED A6 62 D5
0E71:E8 E0 E6 D0 B2 60 A4 61 E5
0E79:88 10 B3 A6 62 86 FB 4C 30
0E81:81 10 FF 11 21 31 4F 62 42
0E89:71 7D 89 A8 C7 A9 00 85 E3
0E91:FF 20 FA 0D 20 E4 FF F0 6B
0E99:FB C9 2D D0 06 A6 FF E0 84
0EA1:07 F0 F1 A2 00 DD 24 10 B5
0EA9:F0 15 E8 E0 14 D0 F6 29 A9
0EB1:3F 09 80 A0 00 91 FC A9 B3
0EB9:01 20 DA 0F 4C 95 0E A5 25
0EC1:04 F0 04 E0 0B B0 CD A9 0B
0EC9:00 A8 85 FE B1 FC 09 80 C4
0ED1:91 FC 8A 0A AA BD 38 10 B4
0ED9:8D E3 0E BD 39 10 8D E4 5D
0EE1:0E 20 FF FF A9 01 85 FE 68
0EE9:4C 95 0E C6 FF 10 04 A9 B1
0EF1:09 85 FF 4C 03 0F E6 FF DA
0EF9:A5 FF C9 0A 90 04 A9 00 AA
0F01:85 FF A5 FF 0A AA BD 96 A3
```

```
0F09:11 85 FC BD 97 11 85 FD 96
0F11:60 68 68 A5 04 D0 03 20 6A
0F19:63 0D A9 00 85 FE 60 A9 F3
0F21:FF 4C DA 0F A9 01 4C DA 63
0F29:0F 20 63 0D A5 FB C9 E5 AA
0F31:F0 43 E6 FB 4C 70 0F 60 D7
0F39:20 63 0D A5 FB C9 DC 90 8D
0F41:04 A9 E5 D0 05 A5 FB 18 64
0F49:69 0A 85 FB 4C 70 0F 20 71
0F51:63 0D A5 FB C9 0A B0 04 B4
0F59:A9 00 F0 05 A5 FB 38 E9 32
0F61:0A 85 FB 4C 70 0F 20 63 8D
0F69:0D A5 FB F0 08 C6 FB 20 79
0F71:81 10 20 FA 0D 60 20 20 52
0F79:0F A9 A0 91 FC 60 A0 00 61
0F81:C8 B1 FC 10 07 88 91 FC 8B
0F89:C8 4C 81 0F 88 A9 A0 91 FD
0F91:FC 60 A0 FF C8 B1 FC 30 91
0F99:FB 88 88 30 08 B1 FC C8 B5
0FA1:91 FC 4C 9A 0F A0 00 F0 E6
0FA9:E4 A6 FF 4C AF 0F 8A 48 BF
0FB1:0A AA BD 96 11 85 05 BD 07
0FB9:97 11 85 06 A0 FF C8 B1 41
0FC1:05 10 0A C9 AD F0 F7 A9 0F
0FC9:A0 91 05 D0 F1 68 AA 60 31
0FD1:A2 09 20 AF 0F CA 10 FA 41
0FD9:60 85 F8 85 F9 30 04 A9 43
0FE1:00 85 F9 A9 00 85 FE A5 F4
0FE9:FC 48 A5 FD 48 A5 F8 18 10
0FF1:65 FC 85 FC A5 FD 65 F9 6C
0FF9:85 FD B1 FC 10 10 C9 AD 62
1001:D0 15 A5 FF C9 07 D0 0F 9E
1009:20 E4 0F 4C 18 10 68 85 70
1011:FD 68 85 FC 4C 1A 10 68 1E
1019:68 A9 01 85 FE 60 A6 FB 13
1021:4C 49 0C 91 11 9D 1D 0D 9A
1029:14 94 5F 13 93 03 DB DD D3
1031:06 04 09 10 01 A6 DC EC C0
1039:0E F7 0E 20 0F 25 0F F7 45
1041:0E 77 0F 93 0F 7F 0F AA A0
1049:0F D1 0F 12 0F 2A 0F 67 0F
1051:0F 25 0E 6C 0B 97 0B 1F B6
1059:10 81 10 39 0F 50 0F 8A D9
1061:48 A9 70 85 02 A9 17 85 E0
1069:03 E0 00 F0 10 A5 02 18 85
1071:69 C8 85 02 A5 03 69 00 55
1079:85 03 CA D0 F0 68 AA 60 62
1081:A6 FB 20 60 10 A2 00 BD C6
1089:96 11 85 05 BD 97 11 85 2E
1091:06 A0 00 B1 05 10 07 B1 20
1099:02 91 05 C8 10 F5 98 18 ED
10A1:65 02 85 02 A5 03 69 00 D1
10A9:85 03 E8 E8 E0 14 D0 D7 C9
10B1:A9 13 20 40 14 A6 FB E8 8F
10B9:A9 00 4C BA 0A E6 02 D0 A4
10C1:02 E6 03 60 20 0F 0E 20 7C
10C9:93 08 A9 0B 8D 20 D0 8D B7
10D1:21 D0 A2 00 BD 0E 11 85 D8
10D9:02 E8 BD 0E 11 85 03 A0 13
10E1:00 E8 A5 02 05 03 F0 24 4B
10E9:BD 0E 11 F0 08 29 BF 91 93
10F1:02 E8 C8 10 F3 E8 C8 BD F9
10F9:0E 11 86 F8 AA F0 08 A9 98
1101:A0 91 02 C8 CA 10 FA A6 D7
1109:F8 E8 D0 C8 60 50 04 4C 21
1111:41 53 54 20 4E 41 4D 45 8C
1119:3A 20 00 11 A0 04 46 49 5C
1121:52 53 54 20 4E 41 4D 45 25
1129:3A 00 0F F0 04 53 50 4F B6
1131:55 53 45 3A 20 20 20 20 01
1139:00 0F 40 05 41 44 44 52 6D
1141:45 53 53 3A 00 1D 90 05 83
1149:43 49 54 59 3A 20 20 20 32
1151:00 12 E0 05 53 54 41 54 27
1159:45 3A 20 20 00 0E 30 06 51
1161:5A 49 50 3A 20 20 20 20 92
1169:00 0B 80 06 50 48 4F 4E 4F
1171:45 3A 20 20 20 A0 A0 A0 30
1179:AD A0 A0 A0 AD A0 A0 A0 8A
1181:A0 00 00 D0 06 45 58 54 4B
1189:52 41 3A 20 20 00 1E 00 AB
1191:07 00 1E 00 00 5C 04 AC 21
1199:04 FC 04 49 05 99 05 E9 94
11A1:05 39 06 89 06 D9 06 01 92
11A9:07 93 0D 0D 00 0B 1F 41 52
```

```
11B1:44 44 52 45 53 53 20 43 11
11B9:41 54 41 4C 4F 47 45 52 F2
11C1:0D 00 0B A3 A3 A3 A3 A3 9C
11C9:A3 A3 A3 A3 A3 A3 A3 A3 EB
11D1:A3 A3 A3 A3 0D 0D 0D 00 14
11D9:0D 1C 4C 4F 41 44 20 44 A7
11E1:41 54 41 FE 00 0D 53 41 ED
11E9:56 45 20 44 41 54 41 FE AD
11F1:00 0D 44 49 52 45 43 54 F6
11F9:4F 52 59 FE 00 0D 56 49 9D
1201:45 57 20 44 41 54 41 FE C2
1209:00 0D 53 45 41 52 43 48 51
1211:20 44 41 54 41 FE 00 0D D6
1219:41 4C 50 48 41 42 45 54 71
1221:49 5A 45 FE 00 0D 50 52 40
1229:49 4E 54 20 44 41 54 41 23
1231:FE 00 0D 51 55 49 54 9B 9F
1239:21 1C FF FE 04 4E 05 9E E6
1241:05 EE 05 3E 06 8E 06 DE 7D
1249:06 2E 07 93 0D 0D 0D 0D D9
1251:0D 0D 00 0D 1C 41 4C 4C DA
1259:20 49 4E 46 4F 52 4D 41 AD
1261:54 49 4F 4E FE 00 0D 50 33
1269:48 4F 4E 45 20 4C 49 53 BB
1271:54 FE 00 0D 41 44 44 52 46
1279:45 53 53 20 4C 41 42 45 B2
1281:4C 53 FE 00 0D 4D 41 49 E9
1289:4E 20 4D 45 4E 55 9B 21 FA
1291:1C FF 93 0D 0D 0D 0D 0D CA
1299:0D 00 0D 1C 53 45 4C 45 35
12A1:43 54 45 44 FE 00 0D 41 BC
12A9:4C 4C FE 00 0D 4D 41 49 50
12B1:4E 20 4D 45 4E 55 9B 21 23
12B9:1C FF A2 AA A0 11 A9 08 8F
12C1:85 63 86 26 84 27 20 93 49
12C9:08 A0 FF C8 B1 26 D0 0E 7C
12D1:C8 B1 26 AA A9 20 20 40 84
12D9:14 CA 10 F8 30 ED C9 FF 19
12E1:F0 1C C9 FE D0 12 8A 48 DA
12E9:A2 04 BD 61 13 20 40 14 DB
12F1:CA 10 F7 68 AA 4C CC 12 37
12F9:20 40 14 4C CC 12 A2 00 79
1301:86 8B 20 43 13 20 E4 FF 68
1309:C9 91 D0 0E 20 43 13 C6 6E
1311:8B 10 1A A6 63 CA 86 8B 8D
1319:D0 13 C9 11 D0 15 20 43 15
1321:13 E6 8B A5 8B C5 63 90 21
1329:04 A9 00 85 8B 20 43 13 8A
1331:4C 06 13 C9 0D D0 CE A5 EC
1339:C5 C9 01 F0 FA A9 00 85 E7
1341:C6 60 A5 8B 0A AA BD 3C 03
1349:12 85 02 BD 3D 12 85 03 36
1351:A0 00 B1 02 C9 21 F0 07 D9
1359:49 80 91 02 C8 D0 F3 60 68
1361:0D 0D 1C 21 9B A0 00 20 66
1369:E9 13 A5 BD 8D 8A 13 A5 3C
1371:BE 8D 8B 13 A5 C1 8D 8D D9
1379:13 A5 C2 8D 8E 13 A6 BC 8E
1381:F0 1E A9 00 85 BF A0 00 49
1389:B9 FF FF 99 FF FF C8 C4 7C
1391:BF D0 F5 EE 8B 13 EE 8E 8E
1399:13 E0 00 F0 07 CA D0 E2 78
13A1:A5 BB D0 E0 60 A0 01 20 59
13A9:E9 13 A5 BC AA 05 BB D0 BB
13B1:01 60 18 8A 65 BE 8D D6 34
13B9:13 A5 BD 8D D5 13 18 8A 19
13C1:65 C2 8D D9 13 A5 C1 8D DA
13C9:D8 13 E8 A4 BB D0 04 F0 A2
13D1:0D A0 FF B9 FF FF 99 FF 75
13D9:FF 88 C0 FF D0 F5 CE D6 0D
13E1:13 CE D9 13 CA D0 EA 60 81
13E9:A2 E6 C0 00 F0 01 CA 20 74
13F1:60 10 A5 02 38 E5 BD 85 7B
13F9:BB A5 03 E5 BE 85 BC 60 0C
1401:01 20 00 FC 14 07 0D 02 5A
1409:0D 03 0D 04 2C 20 05 0D 53
1411:06 0D FD 01 20 00 FC 14 5E
1419:07 0D 02 0D 03 0D 04 2C 99
1421:20 05 0D 06 0D 08 0D 09 48
1429:0D FD 01 20 00 0D 03 0D C0
1431:04 2C 20 05 0D 06 FE 06 3F
1439:FD 14 14 01 14 2B 14 48 B5
1441:A5 9A C9 03 F0 08 68 C9 8E
1449:0D D0 02 E6 3A 48 68 4C EA
1451:D2 FF 00 00 00 00 00 00 E2
```

Chopper 1

See instructions in article on page 54 before typing in.

```
0801:0B 08 00 00 9E 32 30 37 ED
0809:36 00 00 00 00 00 00 00 34
0811:00 00 00 00 00 00 00 00 21
0819:00 00 00 20 18 17 A9 00 9B
0821:8D 17 D0 8D 1D D0 8D 10 08
0829:D0 AA A9 FF 8D 1C D0 BD BD
0831:40 0A 9D 27 D0 E8 E0 08 FD
0839:D0 F5 4C 88 16 00 00 00 F1
0841:00 00 00 00 00 00 00 00 51
0849:00 00 00 00 00 00 00 00 59
0851:00 55 55 40 00 40 00 01 67
0859:50 00 07 E4 04 1F E9 55 86
0861:5A AA 95 1A A9 44 05 54 5A
0869:00 00 00 00 00 00 00 00 79
0871:00 00 00 00 00 00 00 00 81
0879:00 00 00 00 00 00 00 00 89
0881:00 00 00 00 00 00 00 00 91
0889:00 00 00 00 00 00 00 00 99
0891:00 00 05 55 00 01 00 00 9B
0899:05 40 10 1B D0 55 6B F4 97
08A1:56 AA A5 11 6A A4 00 15 48
08A9:50 00 00 00 00 00 00 00 E1
08B1:00 00 00 00 00 00 00 00 C1
08B9:00 00 00 00 00 00 00 00 C9
08C1:00 00 00 00 00 00 00 00 D1
08C9:00 00 00 00 00 00 00 14 ED
08D1:00 00 69 00 05 FF 50 1A F1
08D9:AA A4 7B BB B9 7B BB B9 80
08E1:1A AA A4 05 69 50 00 41 5C
08E9:00 01 00 40 00 00 00 00 3E
08F1:00 00 00 00 00 00 00 00 02
08F9:00 00 00 00 00 00 00 00 0A
0901:00 00 00 00 00 00 00 00 13
0909:00 00 00 00 00 00 00 00 1B
0911:00 00 00 00 00 00 00 00 23
0919:00 00 00 00 00 00 00 00 2B
0921:0A AA A0 00 00 00 00 00 F6
0929:00 00 00 00 00 00 00 00 3B
0931:00 00 00 00 00 00 00 00 43
0939:00 00 00 00 00 00 00 00 4B
0941:00 00 00 00 00 00 00 00 53
0949:00 00 00 00 00 00 00 00 5B
0951:00 00 00 00 00 00 00 00 63
0959:00 00 00 14 00 00 69 00 7F
0961:01 EB 40 00 55 00 00 00 A1
0969:00 00 00 00 00 00 00 00 7B
0971:00 00 00 00 00 00 00 00 83
0979:00 00 00 00 00 00 50 00 2C
0981:00 00 00 00 00 00 00 00 93
0989:00 00 00 00 00 00 00 00 9B
0991:00 0A 00 A0 02 82 80 00 4B
0999:AA 00 00 28 00 00 AA 00 D8
09A1:02 AA 80 0A 28 A0 0C 3C 28
09A9:30 00 3C 00 00 00 00 00 5B
09B1:00 00 00 00 00 00 00 00 C3
09B9:00 00 00 00 00 00 00 00 CB
09C1:00 00 00 55 00 05 FF 50 8D
09C9:1F FF F4 1F FF F4 7F FF CE
09D1:FD 7D 55 7D 54 00 15 40 D1
09D9:00 01 10 3C 04 04 3C 10 AA
09E1:01 3C 40 0C 69 30 08 28 90
09E9:20 02 AA 80 00 28 00 00 8A
09F1:AA 00 00 82 00 00 82 00 86
09F9:02 82 80 00 00 00 00 00 BD
0A01:00 00 00 C0 00 00 00 80 A1
0A09:32 1E 00 04 97 72 01 ED 74
0A11:E0 2B 7F 90 0F DE DC C1 C8
0A19:FF D0 09 B7 43 20 77 5C E3
0A21:01 DE C4 03 24 80 00 83 DC
0A29:20 00 00 00 00 00 00 00 4D
0A31:00 00 00 00 00 00 00 00 45
0A39:00 00 00 00 00 00 00 02 4F
0A41:00 01 02 03 04 06 01 23 63
0A49:25 25 25 25 25 21 24 00 26
0A51:A2 00 BD 48 0A 9D F8 07 B2
0A59:E8 E0 08 D0 F5 A9 07 8D 1A
0A61:26 D0 A9 00 8D 25 D0 A9 3E
0A69:7F 8D 15 D0 A9 90 8D 0C 07
0A71:D0 A9 77 8D 0D D0 4C 14 78
0A79:0C 20 C9 0A 85 FB 29 0C EF
0A81:C9 04 D0 08 A9 21 8D FE 02
0A89:07 4C 96 0A C9 08 D0 05 BC
0A91:A9 22 8D FE 07 A6 FB BD 2D
0A99:AF 0A 18 6D 0C D0 8D 0C AC
0AA1:D0 BD BA 0A 18 6D 0D D0 E6
0AA9:8D 0D D0 4C 40 0B 00 00 D4
0AB1:00 00 FF FF FF 00 01 01 C8
0AB9:01 00 FF 01 00 00 FF 01 5F
0AC1:00 00 FF 01 00 00 00 00 E5
0AC9:AD 00 DC 29 0F 85 FB A9 13
0AD1:0F 38 E5 FB 60 00 00 00 FA
0AD9:00 EE 34 03 AD 34 03 C9 6E
0AE1:10 D0 17 A9 00 8D 34 03 51
0AE9:EE 35 03 AD 35 03 C9 08 4F
0AF1:D0 08 A9 00 8D 35 03 20 0D
0AF9:37 17 4C 80 0B 00 00 AD 07
0B01:1E D0 85 02 AD 1E D0 A5 58
0B09:02 29 40 F0 10 A5 02 29 C5
0B11:80 D0 0A A9 01 20 89 15 28
0B19:A9 00 20 C0 10 A5 02 29 58
0B21:80 F0 06 A5 02 29 40 F0 F4
0B29:03 4C 98 0B 4C 43 0F 00 25
0B31:00 00 00 00 00 00 00 00 47
0B39:00 00 00 00 00 00 00 AD FC
0B41:52 08 49 54 8D 52 08 AD 64
0B49:53 08 49 05 8D 53 08 AD FB
0B51:54 08 49 40 8D 54 08 AD 3C
0B59:92 08 49 01 8D 92 08 AD 68
0B61:93 08 49 50 8D 93 08 AD E9
0B69:94 08 49 15 8D 94 08 60 75
0B71:00 00 00 00 00 00 00 00 87
0B79:00 00 00 00 00 00 00 EE 7E
0B81:36 03 AD 36 03 C9 16 F0 E8
0B89:03 4C 95 0B A9 00 8D 36 36
0B91:03 20 94 0F 4C E8 0B AD 7E
0B99:15 D0 C9 FF F0 2E AD 00 43
0BA1:DC 29 10 C9 10 D0 03 60 39
0BA9:00 00 20 48 15 8D 0E D0 14
0BB1:AD 0D D0 8D 0F D0 A9 FF E3
0BB9:8D 15 D0 A9 FF 8D 37 03 38
0BC1:AD FE 07 C9 22 D0 05 A9 F3
0BC9:01 8D 37 03 AD 0E D0 C9 EB
0BD1:00 F0 04 C9 13 D0 06 A9 D2
0BD9:7F 8D 15 D0 60 18 6D 37 38
0BE1:03 8D 0E D0 60 00 00 EE 9D
0BE9:38 03 AD 38 03 C9 70 D0 07
0BF1:08 A9 00 8D 38 03 20 51 AE
0BF9:10 4C 21 0C AD 00 D0 C9 E8
0C01:FF F0 04 C9 18 D0 08 AD 34
0C09:10 0C 49 20 8D 10 0C EE 0B
0C11:00 D0 60 A9 30 8D 01 D0 8E
0C19:A9 50 8D 00 D0 4C 45 0C 1A
0C21:EE 39 03 AD 39 03 C9 10 B3
0C29:D0 08 A9 00 8D 39 03 EE 27
0C31:3A 03 AD 3A 03 C9 11 D0 B2
0C39:08 A9 00 8D 3A 03 20 64 1B
0C41:0C 4C DA 0A A2 00 A9 30 07
0C49:9D 03 D0 A9 50 9D 02 D0 73
0C51:E8 E8 E0 0A D0 F0 A9 80 F2
0C59:8D 12 D4 A9 FF 8D 0F D4 1B
0C61:4C D0 0C A2 00 4C 91 11 E4
0C69:C9 30 D0 0F AD 00 D0 9D 2A
0C71:02 D0 4C 35 12 00 00 00 2C
0C79:20 90 16 FE 03 D0 BD 03 52
0C81:D0 C9 ED D0 0B A9 28 99 28
0C89:F9 07 4C F0 12 EA EA EA F5
0C91:E8 E8 E0 0A D0 CF 60 00 9B
0C99:00 A9 20 85 FB A9 D8 85 36
0CA1:FC A9 00 85 FD A9 0E 85 33
0CA9:FE A0 00 B1 FD 91 FB C8 7B
0CB1:C0 08 D0 F7 A5 FB 18 69 7C
0CB9:28 85 FB A5 FC 69 00 85 34
0CC1:FC A5 FD 18 69 08 85 FD 77
0CC9:C9 C8 D0 DD 60 00 00 A9 9D
0CD1:04 8D 9F 0C A9 0D 8D A7 48
0CD9:0C 20 9A 0C A9 D8 8D 9F 7F
0CE1:0C EE A7 0C 20 9A 0C 20 15
0CE9:F3 0C A9 FF 8D 1B D0 4C FA
0CF1:0D 14 A9 3F 8D 39 12 A9 DD
0CF9:27 8D 2D 0F 4C C8 0E A0 E1
0D01:C0 C0 C0 C0 C0 C0 C0 A0 FA
0D09:83 88 8F 90 90 85 92 A0 62
0D11:A0 A0 A0 B1 A0 A0 A0 A0 3C
0D19:C4 C4 C4 C4 C4 C4 C4 A0 0F
0D21:A0 E4 E4 E4 E4 E4 A0 A0 4C
0D29:E7 13 03 0F 12 05 E5 A0 5E
0D31:E7 B0 B0 B0 B0 B0 E5 A0 41
0D39:A0 E3 E3 E3 E3 E3 A0 A0 E7
0D41:A0 E4 E4 E4 E4 E4 A0 A0 6C
0D49:E7 08 09 13 03 12 E5 A0 78
0D51:E7 B0 B0 B0 B0 B0 E5 A0 61
0D59:A0 E3 E3 E3 E3 E3 A0 A0 08
0D61:A0 E4 E4 E4 E4 E4 A0 A0 8C
0D69:E7 0C 05 16 05 0C E5 A0 41
0D71:E7 A0 A0 B1 A0 A0 E5 A0 CA
0D79:A0 E3 E3 E3 E3 E3 A0 A0 28
0D81:A0 A0 A0 A0 A0 A0 A0 A0 9B
0D89:A0 E4 E4 E4 E4 E4 A0 A0 B4
0D91:E7 02 0F 0D 02 13 E5 A0 9B
0D99:E7 A0 B1 B0 B0 A0 E5 A0 85
0DA1:A0 E3 E3 E3 E3 E3 A0 A0 50
0DA9:A0 E4 E4 E4 E4 E4 A0 A0 D4
0DB1:E7 10 12 03 08 14 E5 A0 33
0DB9:EA A0 A0 B3 A0 A0 E5 A0 B4
0DC1:A0 E3 E3 E3 E3 E3 A0 A9 79
0DC9:F6 8D 73 12 4C EA 0D A9 24
0DD1:13 20 80 16 A0 17 A9 0D B0
0DD9:20 D2 FF A9 20 A2 1F 20 3D
0DE1:D2 FF CA 10 FA 88 10 EE C8
0DE9:60 A9 D0 8D 62 0C A9 0C 34
0DF1:8D 63 0C A9 11 8D 37 0C 01
0DF9:AD 1E D0 4C 00 13 00 F6 94
0E01:F6 06 E6 46 F6 B6 56 06 A0
0E09:F6 26 56 C6 C6 F6 F6 D6 38
0E11:06 56 F6 06 F6 F6 F6 D6 5D
0E19:C6 E6 96 F6 F6 26 26 F6 28
0E21:96 F6 F6 46 F6 F6 06 06 2F
0E29:F6 51 D1 B1 51 01 26 F6 3C
0E31:F6 56 56 F6 36 46 C6 F6 E7
0E39:06 C6 56 B6 F6 F6 F6 F6 B8
0E41:F6 06 F6 F6 F6 F6 F6 76 A0
0E49:06 F1 A1 F1 F1 F1 06 C6 62
0E51:C6 F6 26 F6 F6 46 26 56 36
0E59:F6 26 F6 F6 46 26 46 F6 17
0E61:96 E6 C6 F6 B6 26 F6 F6 FD
0E69:A6 41 F1 F1 F1 E1 A6 F6 E1
0E71:F6 26 F6 D6 F6 F6 F6 46 A6
0E79:F6 F6 F6 F6 F6 56 F6 C6 E2
0E81:B6 16 F6 C6 56 C6 B6 B6 BB
0E89:E6 06 F6 F6 06 36 F6 F6 D6
0E91:26 01 A1 41 F1 F1 F6 F6 85
0E99:26 06 36 F6 C6 F6 46 F6 16
0EA1:F6 F6 56 B6 F6 F6 56 C6 34
0EA9:B6 E6 06 A6 46 46 56 C6 C4
0EB1:F6 41 41 F1 41 51 B6 B6 54
0EB9:F6 B6 F6 C6 B6 F6 F6 E6 B0
0EC1:F6 D6 F6 36 C6 E6 B6 A9 3A
0EC9:06 85 FE A9 D0 85 FD AD 0B
0ED1:1B D4 29 07 C9 06 B0 F7 06
0ED9:85 05 E6 05 A0 F0 AD 1B 66
0EE1:D4 29 01 D0 05 A9 A0 4C 3C
0EE9:ED 0E A9 FB 91 FD A5 FE 44
0EF1:18 69 D4 85 FE A9 0F 91 B5
0EF9:FD A5 FE 38 E9 D4 85 FE 8E
0F01:98 38 E9 28 A8 C6 05 A5 49
0F09:05 C9 00 D0 D1 E6 FD A5 F4
0F11:FD C9 F0 D0 BA 60 AD FF 7E
0F19:03 C9 00 D0 03 4C 36 0F FC
0F21:EE FF 03 C9 50 F0 01 60 5C
0F29:AD 1E D0 A9 27 20 9C 15 62
0F31:A9 00 20 C8 10 AD FE 07 F0
0F39:C9 26 B0 03 4C 7A 0A 4C B8
0F41:70 10 A9 02 85 FB A8 A5 04
0F49:02 25 FB F0 05 A9 28 20 7F
0F51:FF 13 C8 18 06 FB C0 07 77
0F59:D0 ED 4C 98 0B 86 FB 18 F0
0F61:46 FB A4 FB 20 63 10 C9 6E
0F69:28 D0 22 20 BA 16 BD 40 FF
0F71:03 C9 0D F0 03 4C 91 0C AC
0F79:A9 00 9D 40 03 A9 25 99 C6
0F81:F9 07 AD 00 D0 9D 02 D0 E5
0F89:A9 30 9D 03 D0 BD 03 D0 C0
0F91:4C 69 0C AD FE 07 C9 28 5C
0F99:D0 01 60 4C 97 10 8D FE 48
0FA1:07 A9 7F 8D 15 D0 60 98 BB
0FA9:38 E9 02 85 FC 18 06 FC 48
0FB1:A6 FC BD 03 D0 C9 35 90 F2
```

```
0FB9:05 A9 28 20 05 12 A9 7F 0F
0FC1:8D 15 D0 60 AD 0C D0 C9 15
0FC9:18 D0 03 EE 0C D0 C9 FF AE
0FD1:D0 03 CE 0C D0 AD 0D D0 DB
0FD9:C9 2D D0 03 EE 0D D0 C9 89
0FE1:EA D0 03 CE 0D D0 4C 17 52
0FE9:0F FE 40 03 4C 0E 10 86 C8
0FF1:FB A2 03 FE 12 05 BD 12 39
0FF9:05 C9 BA D0 0A A9 B0 9D 67
1001:12 05 CA E0 FF D0 EC A6 96
1009:FB 60 00 00 00 86 FB A2 F3
1011:00 38 BD B2 05 FD 12 05 6B
1019:30 09 E9 01 10 13 E8 E0 60
1021:05 D0 EE A2 04 BD 12 05 40
1029:9D B2 05 9D 52 0D CA 10 AB
1031:F4 A6 FB BD 40 03 60 A2 42
1039:00 BD DB 08 5D 4E 10 9D A6
1041:DB 08 9D DE 08 E8 E0 03 9B
1049:D0 EF 4C FD 0B 15 55 54 E2
1051:EE 3F 03 AD 3F 03 C9 03 90
1059:D0 F0 A9 00 8D 3F 03 4C 0F
1061:38 10 B9 28 D0 18 69 01 16
1069:99 28 D0 B9 F9 07 60 EE B1
1071:0D D0 AD 0D D0 C9 FF F0 71
1079:63 60 00 00 A9 21 8D FE 4F
1081:07 A9 90 8D 0C D0 A9 77 E8
1089:8D 0D D0 A9 00 8D FF 03 A1
1091:AD 1F D0 4C B8 10 C9 26 AE
1099:90 01 60 4C 00 0B AD FE 99
10A1:07 C9 26 B0 03 4C C5 0F 6B
10A9:4C BD 15 8D FF 03 20 CE F5
10B1:11 A9 7F 8D 15 D0 60 A9 E3
10B9:3F 8D 39 12 4C 7A 0A 8D 13
10C1:39 12 A9 28 4C 9F 0F 8D 47
10C9:FF 03 EA EA EA AD BC 07 45
10D1:C9 B2 B0 05 A9 26 8D 2D 18
10D9:0F 4C AF 10 20 B4 15 C9 53
10E1:B0 F0 06 CE BC 07 4C 7D 5C
10E9:10 A9 0B 85 D3 A9 09 85 13
10F1:D6 20 10 E5 A2 00 BD 05 7B
10F9:11 20 D2 FF E8 E0 0A D0 B4
1101:F5 4C 35 15 05 47 41 4D 3E
1109:45 20 4F 56 45 52 00 A9 42
1111:01 8D FE 03 60 00 00 AD D7
1119:FE 03 C9 01 F0 03 4C 9F 90
1121:10 AD 00 DC 29 10 D0 0A B9
1129:EA A2 00 8E FE 03 9A 4C D7
1131:40 15 4C 8A 14 00 00 00 8B
1139:AF AF D2 D2 C6 C6 C3 C3 43
1141:C4 C4 C4 C5 C5 C5 B7 B7 58
1149:B7 B7 C5 C5 C5 C4 C4 C4 D9
1151:C3 C3 C6 C6 D2 D2 AF AF 7C
1159:00 A9 00 85 D3 A9 10 85 29
1161:D6 20 10 E5 A2 00 A9 01 C0
1169:8D 86 02 BD 39 11 20 D2 31
1171:FF E8 E0 20 D0 F5 A9 00 9D
1179:8D FF 03 4C 51 0A A2 00 7F
1181:BD 80 DA 49 02 9D 80 DA F4
1189:E8 E0 20 D0 F3 4C 18 11 7B
1191:BD 03 D0 C9 AB D0 24 BD B0
1199:02 D0 38 E9 0E 85 FB 18 2D
11A1:46 FB 18 46 FB 18 46 FB 16
11A9:A4 FB B9 80 06 C9 20 C9 BD
11B1:20 F0 08 A9 20 99 80 06 2A
11B9:4C BF 11 4C 5E 0F 86 FB 11
11C1:18 46 FB A4 FB A9 28 99 BB
11C9:F9 07 4C 5E 0F A9 00 8D C6
11D1:39 12 60 8A 48 A2 1F BD 92
11D9:98 07 9D C0 07 BD 70 07 E0
11E1:9D 98 07 BD 48 07 9D 70 BF
11E9:07 BD 20 07 9D 48 07 BD 4D
11F1:F8 06 9D 20 07 BD D0 06 9E
11F9:9D F8 06 CA 10 D9 68 AA F9
1201:AD 00 D0 60 B9 F7 07 C9 A1
1209:28 F0 03 20 F0 0F A9 28 1F
1211:99 F7 07 60 A9 28 99 F9 02
1219:07 4C 91 0C A2 02 DE 1B BC
1221:07 BD 1B 07 C9 AF D0 08 C2
1229:A9 B9 9D 1B 07 CA 10 EE 68
1231:4C 4B 12 00 AD 1B D4 29 3D
1239:3F C9 03 D0 0A 8A 48 20 08
1241:1D 12 68 AA 4C 79 0C 4C DC
1249:91 0C A2 02 BD 1B 07 C9 DF
1251:B0 D0 06 CA 10 F6 4C D2 37
1259:15 60 00 00 00 8D 7B 12 5F
1261:A9 00 8D F2 03 8A 48 98 A6
1269:48 EE F0 03 D0 FB EE F1 02
1271:03 D0 F6 EE F2 03 AD F2 0B
1279:03 C9 03 D0 EC 68 A8 68 C1
1281:AA 60 00 00 A9 01 20 5E 03
1289:12 A9 00 8D 15 D0 4C A7 26
1291:12 00 00 00 8D 9C 12 8C 4E
1299:9D 12 BD 1C 13 20 D2 FF 49
12A1:CA 10 F7 60 00 00 A9 0B 92
12A9:85 D3 A9 07 85 D6 A9 BB C1
12B1:A0 12 A2 1F 20 E0 12 4C E5
12B9:47 13 20 3A 53 55 4E 4F C9
12C1:42 20 20 20 20 20 20 20 F6
12C9:20 20 20 20 0D 0D 21 44 2F
12D1:45 56 41 53 20 59 54 49 E3
12D9:43 05 00 00 00 00 00 48 29
12E1:8A 48 98 48 20 10 E5 68 6A
12E9:A8 68 AA 68 4C 95 12 20 55
12F1:D4 11 CE F5 03 AD F5 03 BB
12F9:C9 00 F0 3D 4C 91 0C A9 5F
1301:06 8D F5 03 4C 5A 11 A9 14
1309:03 85 D3 A9 07 85 D6 A9 CC
1311:1C A0 13 A2 1B 20 E0 12 27
1319:4C 90 13 20 53 55 4E 4F C9
1321:42 20 4F 4E 20 2D 20 44 79
1329:45 59 4F 52 54 53 45 44 16
1331:20 59 54 49 43 05 00 00 0B
1339:00 A9 01 20 E3 15 A9 00 B2
1341:8D 15 D0 4C 08 13 AD F5 30
1349:03 18 69 30 20 D2 FF A9 1D
1351:30 20 D2 FF 20 D2 FF A9 E7
1359:02 20 5E 12 A9 FB 8D 73 41
1361:12 20 DA 13 CE 7B 05 AD 41
1369:7B 05 C9 30 F0 0F C9 2F 51
1371:D0 15 A9 39 8D 7B 05 20 92
1379:E0 13 4C 88 13 AD 7A 05 30
1381:C9 30 D0 03 4C 02 17 A9 25
1389:15 20 5E 12 4C 62 13 A9 EA
1391:F6 8D 73 12 A9 03 20 5E 1E
1399:12 20 D0 0D 4C BD 13 A9 E4
13A1:D0 8D 62 0C A9 0C 8D 63 9C
13A9:0C 4C DA 0A 20 F3 0C A9 77
13B1:A0 8D 62 0C A9 13 8D 63 B0
13B9:0C 4C 00 13 A9 B1 8D 1B 74
13C1:07 A9 B0 8D 1C 07 8D 1D F9
13C9:07 AD 54 06 C9 B9 F0 DC BD
13D1:4C 4F 17 CE 37 0C 4C AD F1
13D9:13 20 E5 16 4C 0E 10 CE 39
13E1:7A 05 8A 48 20 D4 11 68 3B
13E9:AA 60 BD 03 D0 38 ED 0F B7
13F1:D0 18 69 05 C9 0A B0 03 DE
13F9:4C A8 0F 4C 98 0B 98 38 71
1401:E9 02 85 FC 18 06 FC A6 98
1409:FC 4C EB 13 AD EF 03 C9 6E
1411:01 F0 12 A9 01 8D 15 D0 0C
1419:A9 01 8D EF 03 A9 00 8D 53
1421:39 12 20 EA 10 4C DA 0A 8E
1429:A9 00 8D EF 03 A9 93 4C 09
1431:D2 FF A9 93 20 D2 FF 4C C9
1439:1F 08 AD BC 07 C9 B0 D0 06
1441:06 A9 26 8D FE 07 60 A9 F2
1449:27 8D FE 07 60 00 00 AD 69
1451:00 DC 29 03 C9 03 F0 1D 5F
1459:29 01 C9 00 D0 0D AD 54 F9
1461:06 C9 B9 F0 10 EE 54 06 30
1469:4C 76 14 AD 54 06 C9 B1 B2
1471:F0 03 CE 54 06 AD 54 06 87
1479:8D 74 0D 38 E9 B0 85 FC C4
1481:A9 12 38 E5 FC 8D F5 0D 7F
1489:60 EE F4 03 AD F4 03 C9 7D
1491:15 D0 E2 A9 00 8D F4 03 92
1499:4C 50 14 78 A9 D2 8D 14 CD
14A1:03 A9 14 8D 15 03 58 A2 19
14A9:18 A9 00 9D 00 D4 CA 10 1B
14B1:FA A9 0F 8D 18 D4 A9 E1 C5
14B9:8D 06 D4 8D 0D D4 A9 21 CD
14C1:8D 04 D4 8D 0B D4 A9 01 25
14C9:EA EA EA 8D 64 03 4C 29 49
14D1:14 AD 54 03 C9 01 F0 03 61
14D9:4C 00 16 AD 50 03 C9 01 E8
14E1:D0 1F AD 51 03 CD 55 03 02
14E9:90 17 20 76 15 A9 00 8D 68
14F1:56 03 8D 50 03 AD 52 03 33
14F9:8D 06 15 AD 53 03 8D 07 B0
1501:15 AE 56 03 BD 2C 15 C9 EE
1509:FF F0 09 8D 01 D4 EE 56 F8
1511:03 4C 00 16 A9 00 20 6A 29
1519:15 A9 01 8D 50 03 A9 2C 3F
1521:8D 52 03 A9 15 8D 53 03 2A
1529:4C D2 14 02 02 01 01 01 E7
1531:00 00 FF 00 A9 00 8D 54 18
1539:03 8D 01 D4 4C 10 11 A9 24
1541:01 8D 54 03 4C 7A 16 A9 2C
1549:01 8D 50 03 20 80 15 A9 68
1551:5E 8D 52 03 A9 15 8D 53 98
1559:03 AD 0C D0 60 90 80 70 B5
1561:60 50 40 FF 00 00 00 00 D7
1569:00 8D 51 03 8D 55 03 A9 C2
1571:81 8D 57 03 60 8D 55 03 C1
1579:AD 57 03 8D 04 D4 60 8D 4B
1581:51 03 A9 21 8D 57 03 60 8C
1589:8D FF 03 A9 00 8D 54 03 57
1591:A9 81 8D 04 D4 A9 03 8D C3
1599:01 D4 60 A9 00 8D 01 D4 2D
15A1:A9 41 8D 04 D4 4C 3B 14 45
15A9:AD 0D D0 49 FF 8D 01 D4 A9
15B1:4C 17 0F A9 01 8D 54 03 2E
15B9:AD BC 07 60 AD FE 07 C9 12
15C1:28 F0 ED 4C A9 15 A9 08 BB
15C9:8D 03 D4 8D 02 D4 4C C8 B3
15D1:0D A9 00 8D 54 03 8D 08 97
15D9:D4 8D 74 03 8D 01 D4 4C F6
15E1:85 12 A9 00 8D 54 03 8D D9
15E9:01 D4 8D 08 D4 8D 74 03 C4
15F1:A9 01 4C 5E 12 A9 01 8D 67
15F9:54 03 A9 13 4C D2 FF AD D0
1601:74 03 C9 01 F0 03 4C 31 CE
1609:EA AD 70 03 C9 01 D0 1F 67
1611:AD 71 03 CD 75 03 90 17 9D
1619:20 43 16 A9 00 8D 76 03 A9
1621:8D 70 03 AD 72 03 8D 34 5A
1629:16 AD 73 03 8D 35 16 AE 86
1631:76 03 BD A8 16 C9 FF F0 64
1639:13 8D 08 D4 EE 76 03 4C 44
1641:31 EA 8D 75 03 AD 77 03 8A
1649:8D 0B D4 60 A9 00 8D 71 79
1651:03 8D 75 03 A9 11 8D 77 65
1659:03 A9 01 8D 70 03 A9 6C B9
1661:8D 72 03 A9 16 8D 73 03 BC
1669:4C 00 16 80 7A 74 6E 68 71
1671:62 68 6E 74 7A FF 00 00 D1
1679:00 8D 74 03 4C 33 14 A9 C8
1681:01 8D 74 03 4C F6 15 A9 62
1689:01 8D 74 03 4C C7 15 A9 AD
1691:01 8D 70 03 8D 71 03 A9 C1
1699:11 8D 77 03 A9 A8 8D 72 4E
16A1:03 A9 16 8D 73 03 60 A0 5E
16A9:98 90 88 80 78 70 60 50 F5
16B1:40 30 20 FF 00 00 00 00 0E
16B9:00 A9 01 8D 70 03 A9 01 2D
16C1:8D 71 03 A9 81 8D 77 03 40
16C9:A9 D6 8D 72 03 A9 16 8D D1
16D1:73 03 4C EA 0F 04 03 03 42
16D9:03 03 03 02 02 02 02 FF E4
16E1:00 00 00 00 A9 01 8D 50 CA
16E9:03 8D 51 03 8D 54 03 A9 C2
16F1:11 8D 57 03 A9 5E 8D 52 59
16F9:03 A9 15 8D 53 03 4C F0 BD
1701:0F A9 00 8D 01 D4 8D 54 C4
1709:03 4C 90 13 AD BC 07 C9 47
1711:B0 F0 03 CE F5 03 60 20 BD
1719:9C 14 A9 06 8D 20 D0 A9 68
1721:0E 8D 21 D0 A2 08 BD 31 CC
1729:17 9D 00 80 CA 10 F7 60 39
1731:1C 08 1C 08 C3 C2 CD 38 70
1739:30 AD 8D 02 D0 08 A9 0F C5
1741:8D 18 D4 4C 7F 11 A9 00 2F
1749:8D 18 D4 4C 3A 17 AD F5 23
1751:03 C9 00 D0 03 4C AD 13 38
1759:EE 54 06 4C D4 13 00 00 8C
```

BEFORE TYPING . . .

Before typing in programs, please refer to "How To Type In COMPUTE!'s GAZETTE Programs," which appears before the Program Listings.

TurboDisk 128

See instructions in article on page 68 before typing in.

```
1300:4C 1B 13 A9 6C 8D 30 03 0D
1308:A9 F2 8D 31 03 A0 00 B9 D8
1310:29 13 F0 06 20 0C C0 C8 89
1318:D0 F5 60 A9 5C 8D 30 03 47
1320:A9 13 8D 31 03 A0 1A D0 44
1328:E6 0D 43 31 32 38 20 54 87
1330:55 52 42 4F 44 49 53 4B 0C
1338:20 44 49 53 41 42 4C 45 CE
1340:44 0D 00 0D 43 31 32 38 18
1348:20 54 55 52 42 4F 44 49 84
1350:53 4B 20 45 4E 41 42 4C 93
1358:45 44 0D 00 85 93 A5 93 2D
1360:F0 05 A5 93 4C 6C F2 A2 CA
1368:10 A9 A0 9D C0 16 CA 10 F2
1370:FA A0 00 20 AE F7 C9 24 4B
1378:F0 E8 AD 30 D0 85 FA A9 46
1380:0B 8D 11 D0 A9 FD 8D 30 4F
1388:D0 A0 01 20 AE F7 C9 3A 84
1390:F0 04 A0 00 F0 01 C8 A2 04
1398:FF E8 20 AE F7 9D C0 16 B5
13A0:C8 C4 B7 90 F4 20 8E 14 B5
13A8:A5 BA 20 B1 FF A9 6F 20 15
13B0:93 FF A9 55 20 A8 FF A9 78
13B8:43 20 A8 FF 20 AE FF 78 D1
13C0:20 4D 14 2C 00 0C 30 5D 7D
13C8:A4 C3 A6 C4 A5 B9 F0 06 4F
13D0:AC 02 0C AE 03 0C 84 AE 3A
13D8:86 AF A2 04 AD 00 0C F0 39
13E0:15 20 2F 14 20 4D 14 AD CC
13E8:00 0C 30 3C F0 06 20 2D E8
13F0:14 4C E4 13 A2 02 86 FB 28
13F8:A0 00 BD 00 0C 20 BF F7 7F
1400:C8 E6 FB A6 FB EC 01 0C D1
1408:90 F0 BD 00 0C 20 BF F7 C4
1410:C8 20 40 14 18 A6 FA 8E CD
1418:30 D0 A2 1B 8E 11 D0 A6 93
1420:AE A4 AF 58 60 A9 04 2C 22
1428:A9 00 38 B0 E8 A2 02 86 93
1430:FB A0 00 BD 00 0C 20 BF 8A
1438:F7 C8 E6 FB A6 FB D0 F3 E5
1440:18 98 65 AE 85 AE A5 AF 14
1448:69 00 85 AF 60 A9 FC 8D 02
1450:30 D0 A0 00 AD 00 DD 30 32
1458:FB A9 17 8D 00 DD AD 00 77
1460:DD 10 FB A9 07 8D 00 DD E1
1468:A2 04 CA EA D0 FC A2 04 AE
1470:AD 00 DD 0A 08 0A 26 95 16
1478:28 26 95 CA D0 F2 A5 95 D0
1480:49 FF 99 00 0C C8 D0 CC 72
1488:A9 FD 8D 30 D0 60 A9 10 25
1490:85 FF A9 00 85 FB 85 FD D5
1498:A9 15 85 FC A9 05 85 FE C6
14A0:A5 BA 20 B1 FF A9 6F 20 0F
14A8:93 FF A5 FD A4 FE 8D F0 5C
14B0:14 8C F1 14 A0 00 B9 ED EB
14B8:14 20 A8 FF C8 C0 06 D0 2E
14C0:F5 A0 00 B1 FB 20 A8 FF D8
14C8:C8 C0 20 90 F6 A5 FB 69 42
14D0:1F 85 FB A5 FC 69 00 85 D6
14D8:FC A5 FD 69 20 85 FD A5 F7
14E0:FE 69 00 85 FE 20 AE FF 11
14E8:C6 FF D0 B4 60 4D 2D 57 C3
14F0:00 00 20 FF FF FF FF FF 1D
14F8:FF FF FF FF FF FF FF FF 21
1500:20 42 D0 78 A9 15 8D 07 30
1508:1C A9 12 A0 01 8D 00 03 38
1510:8C 01 03 20 CD 05 A9 03 FB
1518:85 3C A2 00 86 4B F0 2B D6
1520:A0 00 B1 3B 29 BF C9 82 E2
1528:D0 19 C8 C8 C8 B9 BD 06 55
1530:C9 2A F0 42 C9 3F F0 04 3D
1538:D1 3B D0 07 C8 C0 12 F0 03
1540:35 D0 EA E6 4B A6 4B E0 71
1548:08 F0 07 BD 6E 05 85 3B 3D
1550:D0 CE AD 00 03 F0 06 AC E0
1558:01 03 4C 13 05 A9 FF 8D DA
1560:00 03 20 96 05 A9 3A 8D 89
1568:07 1C 58 4C 45 D9 02 22 A4
1570:42 62 82 A2 C2 E2 E6 3B 79
1578:A0 00 B1 3B 8D 00 03 C8 18
1580:B1 3B 8D 01 03 20 CD 05 4D
1588:20 96 05 AD 00 03 D0 F5 87
1590:A9 3A 8D 07 1C 60 A0 00 E3
1598:B9 00 03 85 85 A9 02 8D BC
15A0:00 18 AD 00 18 29 04 F0 E4
15A8:F9 A9 00 8D 00 18 A2 04 BC
15B0:A9 00 06 85 2A 0A 06 85 D3
15B8:2A 0A 8D 00 18 CA D0 F0 AA
15C0:48 68 48 68 A9 00 8D 00 21
15C8:18 C8 D0 CC 60 A9 03 85 4D
15D0:86 AC 01 03 84 07 AD 00 55
15D8:03 C5 06 08 85 06 28 F0 BC
15E0:10 A9 B0 85 00 58 24 00 95
15E8:30 FC 78 A5 00 C9 01 D0 CD
15F0:54 A9 EE 8D 0C 1C A9 06 90
15F8:85 32 A9 00 85 33 85 30 DB
1600:A9 03 85 31 20 5C 06 50 54
1608:FE B8 AD 01 1C 99 00 03 F1
1610:C8 D0 F4 A0 BA 50 FE B8 4B
1618:AD 01 1C 99 00 01 C8 D0 DE
1620:F4 20 E0 F8 A5 38 C5 47 5B
1628:F0 04 A9 22 D0 11 20 E9 1A
1630:F5 C5 3A F0 04 A9 23 D0 FC
1638:06 A9 EC 8D 0C 1C 60 C6 A0
1640:86 D0 AE F0 03 18 69 18 2C
1648:85 44 A9 FF 8D 00 03 20 10
1650:96 05 A9 3A 8D 07 1C A5 48
1658:44 4C C8 C1 20 62 06 4C D1
1660:9E 06 A5 12 85 16 A5 13 16
1668:85 17 A5 06 85 18 A5 07 11
1670:85 19 A9 00 45 16 45 17 FE
1678:45 18 45 19 85 1A 20 34 90
1680:F9 A2 5A 20 9E 06 50 FE 4C
1688:B8 AD 01 1C D9 24 00 D0 8E
1690:06 C8 C0 08 D0 F0 60 CA 60
1698:D0 E9 A9 20 D0 A1 A9 D0 10
16A0:8D 05 18 A9 21 2C 05 18 4E
16A8:10 9E 2C 00 1C 30 F6 AD 47
16B0:01 1C B8 A0 00 60 FF FF 07
16B8:FF FF FF FF FF FF FF FF E4
16C0:A0 A0 A0 A0 A0 A0 A0 A0 EC
16C8:A0 A0 A0 A0 A0 A0 A0 A0 F4
```

TurboDisk 64

See instructions in article on page 64 before typing in.

```
C000:18 90 18 A9 A5 8D 30 03 16
C008:A9 F4 8D 31 03 A0 00 B9 B4
C010:29 C0 F0 06 20 16 E7 C8 C6
C018:D0 F5 60 A9 54 8D 30 03 62
C020:A9 C0 8D 31 03 A0 15 D0 01
C028:E6 0D 54 55 52 42 4F 44 BE
C030:49 53 4B 20 44 49 53 41 C5
C038:42 4C 45 44 0D 00 0D 54 B1
C040:55 52 42 4F 44 49 53 4B 77
C048:20 41 43 54 49 56 41 54 52
C050:45 44 0D 00 85 93 A5 93 80
C058:D0 1E A0 00 B1 BB C9 24 12
C060:F0 16 A2 10 A9 A0 9D AC EC
C068:C3 CA 10 FA B1 BB 99 AC 8C
C070:C3 C8 C4 B7 90 F6 B0 0B E6
C078:A5 93 4C A5 F4 4D 2D 57 24
C080:00 00 20 A9 10 85 FF A9 E0
C088:00 85 FB A9 C2 85 FC A9 55
C090:00 85 FD A9 05 85 FE A5 AF
C098:BA 20 B1 FF A9 6F 20 93 94
C0A0:FF A5 FD A4 FE 8D 80 C0 85
C0A8:8C 81 C0 A0 00 B9 7D C0 95
C0B0:20 A8 FF C8 C0 06 D0 F5 AE
C0B8:A0 00 B1 FB 20 A8 FF C8 EC
C0C0:C0 20 90 F6 A5 FB 69 1F 3B
C0C8:85 FB A5 FC 69 00 85 FC E3
C0D0:A5 FD 69 20 85 FD A5 FE 42
C0D8:69 00 85 FE 20 AE FF C6 32
C0E0:FF D0 B4 A5 BA 20 B1 FF 41
C0E8:A9 6F 20 93 FF A9 55 20 C9
C0F0:A8 FF A9 43 20 A8 FF 20 F3
C0F8:AE FF 78 A9 0B 8D 11 D0 FC
C100:20 7D C1 2C 00 C4 30 53 B4
C108:A4 C3 A6 C4 A5 B9 F0 06 EB
C110:AC 02 C4 AE 03 C4 84 AE D0
C118:86 AF A2 04 AD 00 C4 F0 47
C120:15 20 65 C1 20 7D C1 AD 27
C128:00 C4 30 32 F0 06 20 63 49
C130:C1 18 90 F0 A2 02 A0 00 1A
C138:BD 00 C4 91 AE C8 E8 EC A3
C140:01 C4 90 F4 BD 00 C4 91 DF
C148:AE C8 20 70 C1 18 48 A9 09
C150:1B 8D 11 D0 68 A6 AE A4 D3
C158:AF 58 60 A9 04 2C A9 00 94
C160:38 B0 EB A2 02 A0 00 BD 24
C168:00 C4 91 AE C8 E8 D0 F7 BD
C170:18 98 65 AE 85 AE A5 AF 9F
C178:69 00 85 AF 60 A0 00 AD 8F
C180:00 DD 30 FB A9 17 8D 00 06
C188:DD AD 00 DD 10 FB A9 07 0F
C190:8D 00 DD A2 04 CA EA D0 B2
C198:FC A2 04 AD 00 DD 0A 08 32
C1A0:0A 26 95 28 26 95 CA D0 D5
C1A8:F2 A5 95 49 FF 99 00 C4 81
C1B0:C8 D0 CC 60 EA EA EA EA 30
C1B8:EA EA EA EA EA EA EA EA 3C
C1C0:EA EA EA EA EA EA EA EA 44
C1C8:EA EA EA EA EA EA EA EA 4C
C1D0:EA EA EA EA EA EA EA EA 54
C1D8:EA EA EA EA EA EA EA EA 5C
C1E0:EA EA EA EA EA EA EA EA 64
C1E8:EA EA EA EA EA EA EA EA 6C
C1F0:EA EA EA EA EA EA EA EA 74
C1F8:EA EA EA EA EA EA EA EA 7C
C200:20 42 D0 78 A9 15 8D 07 8B
C208:1C A9 12 A0 01 8D 00 03 93
C210:8C 01 03 20 CD 05 A9 03 57
C218:85 3C A2 00 86 4B F0 2B 32
C220:A0 00 B1 3B 29 BF C9 82 3E
C228:D0 19 C8 C8 C8 B9 A9 06 88
C230:C9 2A F0 42 C9 3F F0 04 98
C238:D1 3B D0 07 C8 C0 12 F0 5E
C240:35 D0 EA E6 4B A6 4B E0 CC
C248:08 F0 07 BD 6E 05 85 3B 98
C250:D0 CE AD 00 03 F0 06 AC 3C
C258:01 03 4C 13 05 A9 FF 8D 36
C260:00 03 20 96 05 A9 3A 8D E4
C268:07 1C 58 4C 45 D9 02 22 FF
C270:42 62 82 A2 C2 E2 E6 3B D4
C278:A0 00 B1 3B 8D 00 03 C8 73
C280:B1 3B 8D 01 03 20 CD 05 A8
C288:20 96 05 AD 00 03 D0 F5 E2
C290:A9 3A 8D 07 1C 60 A0 00 3F
C298:B9 00 03 85 85 A9 02 8D 18
C2A0:00 18 AD 00 18 29 04 F0 40
C2A8:F9 A9 00 8D 00 18 A2 04 18
C2B0:A9 00 06 85 2A 0A 06 85 2F
C2B8:2A 0A 8D 00 18 CA D0 F0 06
C2C0:48 68 48 68 A9 00 8D 00 7C
C2C8:18 C8 D0 CC 60 AC 01 03 2E
C2D0:84 07 AD 00 03 C5 06 08 53
C2D8:85 06 28 F0 10 A9 B0 85 C4
C2E0:00 58 24 00 30 FC 78 A5 0D
C2E8:00 C9 01 D0 4E A9 EE 8D 92
C2F0:0C 1C A9 06 85 32 A9 00 61
C2F8:85 33 85 30 A9 03 85 31 57
C300:20 52 06 50 FE B8 AD 01 29
C308:1C 99 00 03 C8 D0 F4 A0 48
C310:BA 50 FE B8 AD 01 1C 99 B7
C318:00 01 C8 D0 F4 20 E0 F8 E8
C320:A5 38 C5 47 F0 04 A9 22 C2
C328:D0 14 20 E9 F5 C5 3A F0 EB
C330:04 A9 23 D0 09 A9 EC 8D EB
C338:0C 1C 60 18 69 18 85 44 55
C340:A9 FF 8D 00 03 20 96 05 19
C348:A9 3A 8D 07 1C A5 44 4C A1
C350:C8 C1 20 58 06 4C 94 06 C6
C358:A5 12 85 16 A5 13 85 17 E4
C360:A5 06 85 18 A5 07 85 19 DB
C368:A9 00 45 16 45 17 45 18 F7
C370:45 19 85 1A 20 34 F9 A2 9B
C378:5A 20 94 06 50 FE B8 AD C5
C380:01 1C D9 24 00 D0 06 C8 25
C388:C0 08 D0 F0 60 CA D0 E9 55
C390:A9 20 D0 AA A9 D0 8D 05 6A
C398:18 A9 21 2C 05 18 10 9E C4
C3A0:2C 00 1C 30 F6 AD 01 1C 51
C3A8:B8 A0 00 60 A0 A0 A0 A0 24
C3B0:A0 A0 A0 A0 A0 A0 A0 A0 38
C3B8:A0 A0 A0 A0 00 00 00 00 D6
```

Pirate's Cove

Article on page 55.

BEFORE TYPING . . .

Before typing in programs, please refer to "How To Type In COMPUTE!'s GAZETTE Programs," which appears before the Program Listings.

```
KX 10 X=RND(-TI):S=54272:V=532
      48
DP 20 DIM T(25),R$(25),R1$(25)
      ,I$(8)
DC 30 DIM Q$(2,8),Q1$(2,25)
CX 40 DIM A$(2,8),A1$(2,25)
EB 50 DIM D(125),LO(25),LC(25)
      ,L(25)
XE 60 POKE53281,0:POKE53280,0:
      PRINT"{CLR}"
AM 70 FORI=0TO24:POKES+I,0:NEX
      T
XR 80 PRINT"{5 DOWN}"TAB(14)"
      {8}PIRATE COVE":GOSUB147
      0:GOSUB1470
QB 90 PRINT"{9 DOWN}{7 RIGHT}A
       MINI-ADVENTURE FOR KIDS
      "
KQ 100 PRINTTAB(13)"{7}
       {3 DOWN}[PLEASE WAIT]"
GQ 110 FORI=12288TO12607:READA
       :POKEI,A:NEXT
HB 120 POKE2040,193
AA 130 FORI=2041TO2043:POKEI,1
       97:NEXT
XX 140 FORI=V+40TOV+42:POKEI,2
       :NEXT
AH 150 POKEV+39,10:POKEV+37,7:
       POKEV+38,5
BB 160 POKEV+29,15:POKEV+23,1
EH 170 POKEV+28,1:POKEV+27,14
AS 180 POKEV+16,1:POKEV,0:POKE
       V+1,75
EX 190 X=61:Y=81:POKEV+21,1
DF 200 POKEV+2,X:POKEV+4,X+48:
       POKEV+6,X+96
HK 210 FORI=12608TO12608+23:PO
       KEI,255:NEXT
CH 220 FORI=12608+24TO12608+63
       :POKEI,0:NEXT
RR 230 FORI=1TO10:READR$(I):NE
       XT
JC 240 FORI=1TO8:READQ$(1,I):R
       EADA$(1,I):NEXT
KS 250 FORI=1TO8:READQ$(2,I):R
       EADA$(2,I):NEXT
CF 260 FORI=1TO100:READD(I):NE
       XT
GH 270 FORI=1TO25:READLO(I):NE
       XT
DE 280 FORI=11TO25:R$(I)="HIGH
        SEAS":NEXT
JM 290 FORI=1TO10:LC(I)=1:NEXT
RS 300 FORI=11TO25:LC(I)=2:NEX
       T
CG 310 F1=0:F2=0:Q=1
XS 320 FORI=1TO8:I$(I)="":NEXT
MF 330 FORI=1TO25:T(I)=0:NEXT
QH 340 FORI=1TO25
SB 350 RN=INT(RND(1)*25)+1
HS 360 IFT(RN)=1THEN350
CG 370 T(RN)=1:R1$(RN)=R$(I):L
       (RN)=LC(I)
FK 380 NEXT
RP 390 Z=1:FORI=1TO25
PA 400 IFR1$(I)="TREASURE ISLA
       ND"THEN480
FJ 410 IFR1$(I)="SEA MONSTER'S
        LAIR"THEN480
PM 420 IFR1$(I)="HIGH SEAS"THE
       N480
XH 430 Q1$(1,I)=Q$(1,Z)
DF 440 Q1$(2,I)=Q$(2,Z)
GH 450 A1$(1,I)=A$(1,Z)
MM 460 A1$(2,I)=A$(2,Z)
JH 470 Z=Z+1
PA 480 NEXT
FQ 490 FORI=1TO25:IFR1$(I)="PI
       RATE COVE"THENR=I:RR=R
QA 500 NEXT
PH 510 TM=R:IFR1$(R)="TREASURE
        ISLAND"THEN1040
QG 520 PRINT"{CLR}{8}CURRENT L
       OCATION: {GRN}";
DJ 530 GOSUB1470
CA 540 PRINTR1$(R)"{8}"
KQ 550 PRINT"{HOME}{2 DOWN}"
SG 560 IFR1$(R)="HIGH SEAS"THE
       N960
GE 570 IFR1$(R)="SEA MONSTER'S
        LAIR"THEN1270
DX 580 POKE2040,193:POKEV+39,1
       0:POKEV+37,7:POKEV+38,5
AF 590 Y=81:K=1:D=5
HJ 600 POKEV+3,Y:POKEV+5,Y:POK
       EV+7,Y:POKEV+21,15
MF 610 L=LEN(Q1$(1,R)):L2=LEN(
       Q1$(2,R))
XX 620 PRINTTAB(14-L/2)"{8}
       {DOWN}"Q1$(1,R)
ES 630 PRINTTAB(14-L2/2)Q1$(2,
       R)
BG 640 PRINTTAB(10)"READ MAP"
KP 650 PRINTTAB(10)"SAIL ON"
FG 660 PRINTTAB(7)"LIST INVENT
       ORY"
FH 670 GOSUB1790
XG 680 ONKGOTO860,860,1520,690
       ,1910
AS 690 PRINT"{CLR}{3 DOWN}{8}S
       AIL:{YEL}";
DP 700 Y=81:D=4:K=1
MB 710 POKEV+3,Y:POKEV+21,3
HK 720 PRINT"{DOWN}{8}"TAB(5)"
       NORTH"
EP 730 PRINTTAB(5)"SOUTH"
ER 740 PRINTTAB(5)"EAST"
GG 750 PRINTTAB(5)"WEST"
QM 760 GOSUB1790
SK 770 IFK=1THENR=R-5
CJ 780 IFK=2THENR=R+5
CF 790 IFK=3THENR=R+1
DP 800 IFK=4THENR=R-1
PQ 810 IFD(((TM-1)*4)+K)=1THEN
       POKEV+21,1:GOTO510
CE 820 POKE2040,196:POKEV+39,6
       :POKEV+37,1:POKEV+38,7:
       POKEV+21,1
MH 830 PRINT"{4 DOWN}STORM AHE
       AD-GO ANOTHER WAY":PRIN
       T"{8 DOWN}":GOSUB1890:G
       OSUB1470
FD 840 GOSUB1860:R=TM:GOTO690
GQ 850 -----REM SEARCH-----
EG 860 PRINT"{4 DOWN}{PUR}YOU
       {SPACE}FIND "A1$(K,R)
HP 870 G$=A1$(K,R)
FQ 880 IFG$="A KEY"THENF1=1
ES 890 IFG$="A CUTLASS"THENF2=
       1
BX 900 IFLEFT$(G$,7)="NOTHING"
       THEN940
MQ 910 FORI=1TO8:IFG$=I$(I)THE
       N940
KP 920 NEXT
QE 930 I$(Q)=G$:Q=Q+1
PS 940 PRINTTAB(7)"{6 DOWN}":G
       OSUB1860:GOTO510
RF 950 -----REM HIGH SEAS-----
FQ 960 POKE2040,192:POKEV+39,6
       :POKEV+37,1:POKEV+38,2
FC 970 K=1:D=2:Y=81
PB 980 POKEV+3,Y:POKEV+5,Y:POK
       EV+21,7
JQ 990 PRINTTAB(7)"{DOWN}{8}RE
       AD MAP"
QD 1000 PRINTTAB(7)"SAIL ON"
QM 1010 GOSUB1790
DE 1020 ONKGOTO1520,690
BQ 1030 -----REM TREASURE ISLA
        ND-----
DF 1040 POKE2040,193:POKEV+39,
        10:POKEV+37,7:POKEV+38
        ,5
QH 1050 PRINT"{CLR}{8}{9 DOWN}
        YOU HAVE LANDED AT TRE
        ASURE ISLAND":GOSUB189
        0:GOSUB1470
AP 1060 PRINT"{DOWN}AND FOUND
        {SPACE}THE TREASURE CH
        EST"
BS 1070 PRINT"{2 DOWN}{6}PRESS
         ANY KEY TO SEE IF IT
        {SPACE}WILL OPEN."
ME 1080 GETK$:IFK$=""THEN1080
KE 1090 IF F1=1THEN1150
DA 1100 PRINT"{CLR}{9 DOWN}{8}
        YOU DON'T HAVE THE KEY
        "
BJ 1110 PRINT"{DOWN}YOU MUST C
        ONTINUE ON YOUR JOURNE
        Y,"
QQ 1120 PRINT"{DOWN}FIND THE K
        EY AND RETURN TO
KA 1130 PRINT"{DOWN}TREASURE I
        SLAND.{3 DOWN}"
PQ 1140 GOSUB1860:GOTO690
EX 1150 POKE2040,194:POKEV+39,
        6:POKEV+37,1:POKEV+38,
        2:GOSUB1890
FS 1160 PRINT"{CLR}{8}YOUR KEY
         OPENS THE CHEST."
BM 1170 PRINT"YOU WIN"
RK 1180 PRINT"{4 DOWN}{6}OTHER
         TREASURES:{8}{DOWN}"
SR 1190 FORI=1TO8:PRINTI$(I):N
        EXT
GG 1200 PRINT"{2 DOWN}{7}PLAY
        {SPACE}AGAIN [Y/N]
CP 1210 GETK$:IFK$=""THEN1210
BP 1220 IFK$="Y"THENPOKEV+21,0
        :GOTO1250
MG 1230 IFK$="N"THENSYS2048:EN
        D
EQ 1240 GOTO1210
KP 1250 PRINTTAB(9)"{3 DOWN}
        {7}[PLEASE WAIT A MOME
        NT]":GOTO310
ES 1260 -----REM MONSTER-----
CJ 1270 POKEV+39,6:POKEV+37,2:
        POKEV+38,1:POKE2040,19
        5
XP 1280 Y=81:D=2:K=1:POKEV+3,Y
        :POKEV+5,Y:POKEV+21,7:
        GOSUB1890
KG 1290 PRINTTAB(6)"{DOWN}SAIL
         AWAY"
CG 1300 PRINTTAB(8)"FIGHT"
RX 1310 GOSUB1790
DX 1320 IFK=2THEN1390
MK 1330 RN=RND(1):IFRN>.8THENT
        M=R:GOTO690
RJ 1340 PRINT"{3 DOWN}NOT FAST
         ENOUGH"
JJ 1350 PRINT"THE MONSTER DAMA
        GED YOUR SHIP"
QM 1360 PRINT"YOU MUST GO BACK
         TO PIRATE COVE AND
JE 1370 PRINT"START OVER AGAIN
        .{4 DOWN}"
GJ 1380 R=RR:GOSUB1860:GOTO510
```

```
SJ 1390 IFF2=0THEN1430
SB 1400 PRINT"{2 DOWN}YOU DEFE
        ATED THE SEA MONSTER"
JE 1410 PRINT"YOU MAY CONTINUE
         ON YOUR JOURNEY.
        {4 DOWN}"
SE 1420 TM=R:GOSUB1860:POKEV+2
        1,1:GOTO690
HK 1430 PRINT"{2 DOWN}YOU CANN
        OT FIGHT THE MONSTER W
        ITHOUT"
JX 1440 PRINT"A CUTLASS"
PX 1450 GOTO1360
RF 1460 -----REM SOUND SUB----
        -
JE 1470 POKES+24,15:POKES+5,9:
        POKES+4,17
GD 1480 POKES+1,6:POKES,108:FO
        RT=1TO1000:NEXT
AQ 1490 POKES+4,16:FORT=1TO25:
        NEXT
EX 1500 RETURN
RM 1510 -----REM DRAW MAP-----
XK 1520 POKEV+21,0
FR 1530 PRINT"{CLR}{2 DOWN}"TA
        B(7)"[8]NAVIGATION MAP
        {2 DOWN}"
RB 1540 X$="O[Y]P"
XQ 1550 Y$="[H] [N]"
HC 1560 Z$="L[P]@"
CK 1570 FORI=1TO5:PRINTTAB(7);
DF 1580 FORJ=1TO5:PRINTX$;:NEX
        T:PRINT
AE 1590 PRINTTAB(7);
SM 1600 FORJ=1TO5:PRINTY$;:NEX
        T:PRINT
CE 1610 PRINTTAB(7);
AK 1620 FORJ=1TO5:PRINTZ$;:NEX
        T:PRINT
AK 1630 NEXT
SQ 1640 FORI=1TO25
FM 1650 IFL(I)=1THENPOKELO(I),
        81:POKELO(I)+S,5
QG 1660 IFL(I)=2THENPOKELO(I),
        45:POKELO(I)+S,6
EM 1670 NEXT
JP 1680 POKELO(R),81:POKELO(R)
        +S,7
KQ 1690 PRINT"{HOME}{6 DOWN}"T
        AB(27)"{GRN}Q[8] = LAN
        D"
RK 1700 PRINTTAB(27)"{BLU}-[8]
         = WATER"
BE 1710 PRINTTAB(27)"{YEL}Q[8]
         = CURRENT"
SB 1720 PRINTTAB(31)"LOCATION"
FM 1730 PRINTTAB(33)"{3 DOWN}
        {YEL}N"
KP 1740 PRINTTAB(33)"-"
JK 1750 PRINTTAB(31)"W-Q-E"
HM 1760 PRINTTAB(33)"-"
EQ 1770 PRINTTAB(33)"S"
HK 1780 PRINT"{4 DOWN}":GOSUB1
        860:GOTO510
HQ 1790 GETK$:IFK$=""THEN1790
GR 1800 IFK$=CHR$(13)THENRETUR
        N
PD 1810 IFK$<>"{DOWN}"THEN1790
EB 1820 K=K+1:Y=Y+8
JM 1830 IFK>DTHENK=1:Y=81
DH 1840 POKEV+3,Y:POKEV+5,Y:PO
        KEV+7,Y
ER 1850 GOTO1790
RX 1860 PRINTTAB(6)"[7][PRESS
        {SPACE}ANY KEY TO CONT
        INUE]"
MK 1870 GETK$:IFK$=""THEN1870
QG 1880 RETURN
GQ 1890 FORI=1TO11:POKE53280,I
RM 1900 FORT=1TO25:NEXT:NEXT:P
        OKE53280,0:RETURN
EJ 1910 PRINT"{2 DOWN}INVENTOR
        Y:{DOWN}"
AA 1920 FORI=1TO8:PRINTI$(I):N
        EXT
SG 1930 PRINT"{DOWN}":GOSUB186
        0:POKEV+21,1:GOTO520
AB 1940 DATA 0,0,0,1,192,0,1,1
        92
AQ 1950 DATA 0,4,192,0,4,192,0
        ,20
XR 1960 DATA 192,0,20,192,0,20
        ,193,192
BK 1970 DATA 20,197,192,4,197,
        192,4,197
QM 1980 DATA 192,1,197,192,1,1
        93,192,240
JS 1990 DATA 192,207,63,255,25
        2,15,255,252
CX 2000 DATA 3,255,252,170,187
        ,190,42,174
DC 2010 DATA 234,10,170,168,0,
        170,128,255
FG 2020 DATA0,0,0,0,0,60,0,0
EG 2030 DATA192,3,195,0,0,51,2
        40,0
QD 2040 DATA15,12,3,248,192,12
        ,8,48
RB 2050 DATA0,50,48,0,194,0,0,
        192
CB 2060 DATA128,0,192,128,0,0,
        128,0
GD 2070 DATA0,128,0,2,0,0,86,6
        4
PM 2080 DATA5,85,84,21,85,80,1
        ,85
JF 2090 DATA64,0,21,0,0,0,0,0
DB 2100 DATA5,0,0,1,64,0,0,80
QD 2110 DATA0,0,20,0,0,5,0,0
JG 2120 DATA1,64,0,0,80,21,85,
        80
EK 2130 DATA16,0,16,18,170,16,
        18,34
ME 2140 DATA16,208,32,16,16,32
        ,28,16
RR 2150 DATA32,16,208,32,19,21
        ,85,80
HF 2160 DATA0,0,204,48,12,48,0
        ,195
AJ 2170 DATA12,12,12,48,0,0,19
        2,0
GD 2180 DATA0,16,0,0,32,0,0,8
XA 2190 DATA0,0,8,0,0,8,0,72
XR 2200 DATA32,33,34,32,136,0,
        170,0
DD 2210 DATA0,158,0,10,182,160
        ,160,158
MC 2220 DATA10,128,182,2,64,17
        0,1,2
DE 2230 DATA8,128,8,8,32,8,32,
        32
QM 2240 DATA16,32,4,0,32,0,0,8
QF 2250 DATA0,0,4,0,0,0,0,0
RB 2260 DATA 1,84,0,4,1,64,4,0
HF 2270 DATA 20,16,0,1,16,80,1
        ,17
BM 2280 DATA 0,1,64,0,65,64,0,
        68
EJ 2290 DATA 16,1,80,5,84,128,
        128,48
XQ 2300 DATA 8,8,50,0,0,192,20
        0,32
KS 2310 DATA 200,192,0,192,194
        ,35,195,32
GQ 2320 DATA 3,35,0,3,3,8,3,12
PX 2330 DATA 0,0,12,0,0,12,0,7
        2
ME 2340 DATA TREASURE ISLAND,
        {SPACE}SEA MONSTER'S L
        AIR, BLUEBEARD'S BAY
SE 2350 DATA MERMAID'S LAGOON,
         CAPT. HOOK'S SWAMP, S
        PICE ISLAND
SG 2360 DATA JEWEL ISLAND, SKE
        LETON INLET, BARBARY C
        OAST,PIRATE COVE
AP 2370 DATA SIFT THROUGH SAND
        , A FEW PIECES OF EIGH
        T
AX 2380 DATA SEARCH ISLAND, NO
        THING OF INTEREST.
GJ 2390 DATA SEARCH OLD GALLEO
        N, SOME SILVER JEWELRY
AE 2400 DATA SEARCH ISLAND, EX
        OTIC SPICES
FP 2410 DATA SEARCH HARBOR, A
        {SPACE}CUTLASS
QE 2420 DATA SEARCH SWAMP, NOT
        HING BUT SNAKES
PK 2430 DATA SEARCH JUNGLE, A
        {SPACE}BEAUTIFUL PARRO
        T
XS 2440 DATA SAIL ALONG COAST,
         NOTHING OF INTEREST.
GF 2450 DATA SEARCH ALONG DOCK
        , NOTHING OF INTEREST.
DX 2460 DATA SEARCH NATIVE HUT
        S, A KEY
XX 2470 DATA SEARCH STREAM,NOT
        HING BUT ALLIGATORS
BX 2480 DATA SEARCH ALONG CLIF
        FS, NOTHING OF INTERES
        T.
SX 2490 DATA SEARCH WOODS, NOT
        HING OF INTEREST.
XC 2500 DATA SEARCH WRECKED SH
        IP, SOME GEMS
AA 2510 DATA SEARCH OLD SHIP,
        {SPACE}NOTHING BUT AN
        {SPACE}OLD COMPASS.
AD 2520 DATA COMB BEACHES, A F
        EW DOUBLOONS
ED 2530 DATA 0,1,1,0,0,1,1,1,0
        ,1,1,1,0,1,1,1,0,1,0,1
XM 2540 DATA 1,1,1,0,1,1,1,1,1
        ,1,1,1,1,1,1,1,1,1,0,1
MF 2550 DATA 1,1,1,0,1,1,1,1,1
        ,1,1,1,1,1,1,1,1,1,0,1
KE 2560 DATA 1,1,1,0,1,1,1,1,1
        ,1,1,1,1,1,1,1,1,1,0,1
XQ 2570 DATA 1,0,1,0,1,0,1,1,1
        ,0,1,1,1,0,1,1,1,0,0,1
BE 2580 DATA 1272,1275,1278,12
        81,1284
GA 2590 DATA 1392,1395,1398,14
        01,1404
PK 2600 DATA 1512,1515,1518,15
        21,1524
JF 2610 DATA 1632,1635,1638,16
        41,1644
MB 2620 DATA 1752,1755,1758,17
        61,1764
```

Turbo BootMaker

Article on page 67.

```
AC 100 PRINT"{CLR}{2 DOWN}
       {WHT}"CHR$(8)CHR$(14):P
       RINT TAB(10)"** TURBOBO
       OTMAKER **":Z$=CHR$(0)
AB 110 FOR AD=822 TO 915:READ
       {SPACE}BY:CK=CK+BY:POKE
        AD,BY:NEXT:IF CK=11597
        THEN 130
GP 120 PRINT"{2 DOWN}{RVS}ERRO
       R IN DATA STATEMENTS!":
       STOP
GH 130 PRINT"{DOWN}{2 SPACES}I
       NSERT A DISK CONTAINING
        TURBODISK."
PQ 140 PRINT TAB(7)"PRESS
       {RVS} RETURN {OFF} WHEN
        READY."
XC 150 GET K$:IF K$<>CHR$(13)
```

```
       {SPACE}THEN 150
RJ 160 CLOSE 15:OPEN 15,8,15,"
       I0":GOSUB 500:IF E THEN
        600
EF 170 T$="":PRINT"{DOWN}NAME
       {SPACE}OF TURBODISK FIL
       E:":INPUT T$:IF T$="" T
       HEN 170
GA 180 OPEN 1,8,8,"0:"+T$+",P,
       R":GET#1,A$,B$:GOSUB 50
       0:IF E THEN 600
QH 190 TL=ASC(A$+Z$):TH=ASC(B$
       +Z$):POKE 834,TL:POKE 8
       36,TH:POKE 861,TL:POKE
       {SPACE}862,TH
MP 200 TS=49152:TE=TS:PRINT TA
       B(7)"{DOWN}READING: "T$
PH 210 FOR SS=0 TO 1:GET#1,A$:
       SS=ST:POKE TE,ASC(A$+Z$
       ):TE=TE+1:NEXT
SE 220 CLOSE 1:IF ST<>64 THEN
       {SPACE}PRINT"{2 DOWN}
       {RVS}ERROR READING TURB
       ODISK FILE.":STOP
AA 230 PRINT"{DOWN} INSERT THE
        DISK ON WHICH YOU WISH
        TO":PRINT" CREATE THE
       {SPACE}BOOT FILE."
KF 240 PRINT TAB(7)"PRESS
       {RVS} RETURN {OFF} WHEN
        READY."
SM 250 GET K$:IF K$<>CHR$(13)
       {SPACE}THEN 250
XK 260 PRINT#15,"I0":GOSUB500:
       IF E THEN600
SE 270 P$="":PRINT"{DOWN}NAME
       {SPACE}OF PROGRAM TO TU
       RBOBOOT:":INPUT P$:IF P
       $="" THEN 290
JH 280 P=LEN(P$):POKE 874,P:FO
       R I=1 TO P:POKE 899+I,A
       SC(MID$(P$,I)):NEXT
SH 290 OPEN 1,8,8,"0:"+P$+",P,
       R":GOSUB 500:CLOSE 1:IF
        E=0 THEN 310
SX 300 IF E=62 THEN PRINT"
       {DOWN} REMEMBER TO PUT
       {SPACE}A COPY OF "P$:PR
       INT" ON THIS DISK."
AC 310 PRINTTAB(5)"{DOWN}IS TH
       E PROGRAM BASIC OR ML?"
       :PRINTTAB(9)"PRESS
       {RVS} B {OFF} OR {RVS}
       {SPACE}M {OFF}"
SM 320 GET K$:IF K$="B" THEN 3
       80
XP 330 IF K$<>"M" THEN 320
BX 340 A$="":INPUT"{DOWN}START
       ING ADDRESS";A$:IF A$="
       " THEN 340
PB 350 D=0:IF LEFT$(A$,1)<>"$"
        THEN D=VAL(A$):GOTO 37
       0
HP 360 FOR I=2 TO LEN(A$):A=(A
       SC(MID$(A$,I))AND 127)-
       48:D=(16*D)+A+(7*(A>9))
       :NEXT
QM 370 DH=INT(D/256):DL=D-(256
       *DH):POKE 891,76:POKE 8
       92,DL:POKE 893,DH
KQ 380 B$="":PRINT"{DOWN}NAME
       {SPACE}FOR TURBOBOOTING
        FILE:":INPUT B$:IF B$=
       "" THEN 380
BD 390 OPEN 1,8,8,"0:"+B$+",P,
       W":GOSUB 500:IF E THEN
       {SPACE}600
PD 400 PRINT TAB(7)"{DOWN}WRIT
       ING: "B$
KP 410 PRINT#1,CHR$(38);CHR$(3
       );CHR$(54);CHR$(3);
JR 420 FOR AD=808 TO 915:PRINT
       #1,CHR$(PEEK(AD));:NEXT
XK 430 FOR AD=TS TO TE:PRINT#1
       ,CHR$(PEEK(AD));:NEXT
BG 440 CLOSE 1:GOSUB 500:IF E
       {SPACE}THEN 600
JA 450 CLOSE 15:PRINT"{2 DOWN}
       "B$" WILL NOW TURBOBOOT
        "P$:END
AR 500 INPUT#15,E,E$:RETURN
SC 600 CLOSE 1:PRINT"{DOWN}
       {RVS}";
JD 610 IF E=62 THEN PRINT"NO F
       ILE WITH THAT NAME ON T
       HIS DISK.":GOTO 170
RP 620 IF E=63 THEN PRINT"THAT
        NAME IS ALREADY USED O
       N THIS DISK.":GOTO 380
FD 630 CLOSE15:PRINT"DISK ERRO
       R:";E;E$:END
JS 822 DATA 32,138,255,169,148
       ,160,3,133,251,132
KH 832 DATA 252,169,0,160,192,
       133,253,132,254,160
HQ 842 DATA 0,177,251,145,253,
       200,208,249,230,252
JA 852 DATA 230,254,165,254,20
       1,196,208,239,32,0
GB 862 DATA 192,32,68,229,166,
       186,160,1,32,186
BJ 872 DATA 255,169,1,162,132,
       160,3,32,189,255
AP 882 DATA 169,0,32,213,255,1
       34,45,132,46,32
PA 892 DATA 94,166,32,142,166,
       76,174,167,42,0,0,0,0,0
       ,0,0,0,0,0,0,0,0,0
```

Slots

Article on page 51.

```
JC 10 POKE56,48:POKE55,0:CLR:G
      OTO40
KG 20 POKEXR,YC:POKEXR+1,X:POK
      EXR+2,0:SYS65520:RETURN
MF 30 X=11:YC=23:GOTO20
KG 40 IFPEEK(808)=237THENPOKE5
      3281,15:POKE53280,15:KB=
      198:FL=1:XR=781:GOTO60
XQ 50 KB=239:FL=0:XR=2035:POKE
      65305,241
KA 60 GOSUB470:PRINT"{CLR}
      {5 DOWN}":C$(0)="{PUR}IJ
      K{DOWN}{3 LEFT}LMN":C$(1
      )="{BLU}"+RIGHT$(C$(0),1
      0)
HS 70 IFFL=0THENPOKE12909,0:PO
      KE12910,255
ED 80 PRINT"{GRN}{2 SPACES}
      {RVS}{4 SPACES}{OFF}
      {3 SPACES}{RVS}
      {2 SPACES}{OFF}
      {7 SPACES}{RVS}
      {4 SPACES}{OFF}
      {3 SPACES}{RVS}
      {6 SPACES}{OFF}
      {3 SPACES}{RVS}
      {4 SPACES}{OFF}
      {3 SPACES}{RVS}
      {2 SPACES}{OFF}
      {2 SPACES}{RVS}
      {2 SPACES}{OFF}
      {2 SPACES}{RVS}
      {2 SPACES}";
HD 90 PRINT"{OFF}{6 SPACES}
      {RVS}{2 SPACES}{OFF}
      {2 SPACES}{RVS}
      {2 SPACES}{OFF}
      {4 SPACES}{RVS}
      {2 SPACES}{OFF}
      {4 SPACES}{RVS}
      {2 SPACES}{OFF}
      {2 SPACES}{RVS}
      {2 SPACES}{OFF}
      {2 SPACES}{RVS}
      {2 SPACES}{OFF}
      {6 SPACES}{RVS}
      {2 SPACES}{OFF}
      {6 SPACES}{RVS}
      {2 SPACES}{OFF} ";
QD 100 PRINT" {RVS}{2 SPACES}
       {OFF}{4 SPACES}{RVS}
       {2 SPACES}{OFF}
       {4 SPACES}{RVS}
       {2 SPACES}{OFF}
       {7 SPACES}{RVS}
       {4 SPACES}{OFF}
       {3 SPACES}{RVS}
       {2 SPACES}{OFF}
       {6 SPACES}{RVS}
       {2 SPACES}{OFF}
       {2 SPACES}{RVS}
       {2 SPACES}{OFF}
       {4 SPACES}{RVS}
       {2 SPACES}{OFF} ";
SD 110 PRINT"{4 SPACES}{RVS}
       {4 SPACES}{OFF}
       {7 SPACES}{RVS}
       {2 SPACES}{OFF}
       {2 SPACES}{RVS}
       {2 SPACES}{OFF}
       {6 SPACES}{RVS}
       {2 SPACES}{OFF}
       {2 SPACES}{RVS}
       {2 SPACES}{OFF}
       {4 SPACES}{RVS}
       {2 SPACES}{OFF}
       {8 SPACES}{RVS}
       {2 SPACES}{OFF}
       {2 SPACES}{RVS}";
FD 120 PRINT"{2 SPACES}{OFF}
       {2 SPACES}{RVS}
       {2 SPACES}{OFF}
       {2 SPACES}{RVS}
       {2 SPACES}{OFF}
       {6 SPACES}{RVS}
       {2 SPACES}{OFF}
       {2 SPACES}{RVS}
       {2 SPACES}{OFF}
       {4 SPACES}{RVS}
       {2 SPACES}{OFF}
       {4 SPACES}{RVS}
       {2 SPACES}{OFF}
       {2 SPACES}{RVS}
       {2 SPACES}{OFF}
       {3 SPACES}{RVS}
       {4 SPACES}{OFF}
       {3 SPACES}{RVS}";
BQ 130 PRINT"{6 SPACES}{OFF}
       {3 SPACES}{RVS}
       {4 SPACES}{OFF}
       {5 SPACES}{RVS}
       {2 SPACES}{OFF}
       {5 SPACES}{RVS}
       {4 SPACES}{OFF}"
PE 140 X=8:YC=21:GOSUB20:PRINT
       "DO YOU WANT TO GO FIRS
       T":POKEKB,0
SX 150 GETY$:IFY$<>"Y"ANDY$<>"
       N"THEN150
AX 160 L1=0:GOSUB430
DP 170 L1=1:SYS12445
BM 180 PRINT"{CLR}{2 DOWN}
       {GRN}"SPC(4);:FORA=1TO8
       :PRINTA" ";:NEXT
FB 190 PRINT"{BLK}":FORA=1TO16
       :PRINT"{3 SPACES}-
       {3 SPACES}-{3 SPACES}-
       {3 SPACES}-{3 SPACES}-
       {3 SPACES}-{3 SPACES}-
       {3 SPACES}-{3 SPACES}-"
       :NEXT
```

```
FS 200 PRINT"{3 SPACES}{RVS}
       {33 SPACES}"
AM 210 IFY$="Y"THEN250
BK 220 Y=INT(RND(TI+Y)*7+.2)
RG 230 POKE12288+Y,255:POKE123
       69+Y,Y+9
EC 240 X=4+Y*4:YC=17:GOSUB20:P
       RINTC$(0)
XG 250 GOSUB30:PRINT"{BLU} YOU
       R MOVE (1-8){3 SPACES}
       {2 LEFT}";:POKEKB,0
PD 260 GETY$:IFY$="L"THENGOSUB
       430:GOSUB30:PRINT"
       {2 UP}{17 SPACES}":GOTO
       250
DM 270 IFY$<"1"ORY$>"8"THEN260
ED 280 Y=VAL(Y$)-1:POKE12400,Y
       :TK=1:CL=1:GOSUB390
FC 290 IFYC<5THEN360
AC 300 GOSUB30:PRINT"{PUR} COM
       PUTER MOVES ":SYS12468
PH 310 P5=PEEK(12397):IFP5=1TH
       EN360
GR 320 Y=PEEK(12389):TK=255:CL
       =0:GOSUB390
JF 330 IFP5=255THEN370
FE 340 GOSUB30:PRINTSPC(15)Y+1
       "{LEFT}{4 SPACES}"
JF 350 FORI=1TO1800:NEXT:GOTO2
       50
QH 360 GOSUB30:PRINT"{GRN}
       {5 SPACES}YOU WIN
       {8 SPACES}":GOTO380
PM 370 GOSUB30:PRINT"{GRN}
       {5 SPACES}YOU LOSE
       {7 SPACES}"
JH 380 FORI=1TO3500:NEXT:GOTO1
       40
CD 390 P=PEEK(12369+Y)
SH 400 POKE12288+P,TK:POKE1236
       9+Y,P+9
QA 410 P1=INT(P/9):P2=INT((P/9
       -P1)*9+.1)
RD 420 X=P2*4+4:YC=17-2*P1:GOS
       UB20:PRINTC$(CL):RETURN
PP 430 GOSUB30:PRINT"{GRN}
       {2 UP}{4 LEFT}
       {4 SPACES}ENTER LEVEL (
       1-4){4 SPACES}":POKEKB,
       0
EQ 440 GETA$:IFA$<"1"ORA$>"4"T
       HEN440
EC 450 L=VAL(A$):IFL1THENL=L-1
RQ 460 POKE12399,L:POKE12397,0
       :RETURN
MB 470 PRINT"{CLR}":X=14:YC=12
       :GOSUB20:PRINT"{BLK}PLE
       ASE WAIT"
CD 480 IFFLTHENPOKE56334,0:POK
       E1,51
ME 490 IFFL=0THENPOKE1177,62
PJ 500 FORA=0TO2047:POKEA+1433
       6,PEEK(A+53248):NEXTA:I
       FFL=0THENPOKE1177,63:GO
       TO520
DH 510 POKE1,55:POKE56334,129:
       POKE53272,30:GOTO530
GQ 520 POKE65298,PEEK(65298)AN
       D251:POKE65299,PEEK(652
       99)AND3OR56
CS 530 FORA=584TO631:READB:POK
       EA+14336,B:NEXT
BR 540 C=0:FORA=12402TO12972:R
       EADB:C=C+B:POKEA,B:NEXT
       :IFC=58347THENRETURN
JJ 550 PRINT"{CLR}ERROR IN DAT
       A":STOP
PS 560 DATA 0,3,15,31,63,63,12
       7,127
SQ 570 DATA 254,255,255,255,25
       5,255,255,255
AS 580 DATA 0,128,224,240,248,
       248,252,252
MS 590 DATA 127,127,63,63,31,1
       5,3,0
FQ 600 DATA 255,255,255,255,25
       5,255,255,254
EB 610 DATA 252,252,248,248,24
       0,224,128,0
MK 620 DATA 255,1,8,248,10,246
       ,247,1,255,1,255,255,1,
       255,1,0,2,8,36
EM 630 DATA 0,1,2,16,142,108,4
       8,174,107,48,189,129,48
       ,24,121,93,48,153,93
KP 640 DATA 48,174,108,48,96,2
       06,111,48,160,7,152,153
       ,81,48,136,16,249,160,8
       0
XQ 650 DATA 169,0,153,0,48,136
       ,16,248,96,172,111,48,1
       69,0,153,97,48,9,64
HB 660 DATA 153,93,48,41,0,136
       ,16,243,200,169,1,141,7
       5,49,169,8,141,141,48
RD 670 DATA 169,121,141,57,49,
       169,7,141,110,48,174,11
       2,48,189,81,48,56,233,9
MJ 680 DATA 157,81,48,32,12,49
       ,169,107,141,141,48,174
       ,112,48,189,81,48,24,10
       5
DD 690 DATA 9,157,81,48,173,10
       9,48,208,8,169,0,141,10
       9,48,76,95,49,96,190
KD 700 DATA 89,48,189,81,48,14
       1,105,48,169,0,141,106,
       48,170,173,105,48,141,1
       13
XQ 710 DATA 48,173,106,48,208,
       5,169,0,141,107,48,189,
       114,48,24,109,113,48,14
       1
HP 720 DATA 113,48,141,54,49,1
       73,1,48,217,121,48,208,
       19,238,107,48,32,137,48
EX 730 DATA 173,107,48,201,3,2
       08,222,169,1,141,109,48
       ,96,173,106,48,73,1,141
BF 740 DATA 106,48,232,236,110
       ,48,208,186,96,169,0,15
       3,89,48,190,89,48,189,8
       1
QQ 750 DATA 48,201,54,144,30,2
       01,63,176,8,169,0,153,9
       3,48,76,140,49,185,89
QD 760 DATA 48,153,101,48,185,
       125,48,141,109,48,153,9
       7,48,76,151,50,74,74,74
RE 770 DATA 24,121,93,48,153,9
       3,48,169,129,141,144,48
       ,169,121,141,57,49,169,
       7
CC 780 DATA 141,110,48,32,9,49
       ,169,0,141,109,48,185,1
       25,48,141,75,49,169,133
KJ 790 DATA 141,144,48,169,125
       ,141,57,49,169,7,141,11
       0,48,32,9,49,173,109,48
ME 800 DATA 240,12,153,97,48,1
       85,89,48,153,101,48,76,
       151,50,169,0,141,109,48
MJ 810 DATA 190,89,48,189,81,4
       8,24,105,9,141,105,48,1
       69,0,141,106,48,170,173
BF 820 DATA 105,48,141,113,48,
       173,106,48,208,5,169,0,
       141,107,48,189,114,48,2
       4
HK 830 DATA 109,113,48,141,113
       ,48,141,11,50,173,221,4
       8,217,121,48,208,18,238
       ,107
GK 840 DATA 48,173,107,48,201,
       3,208,225,169,0,153,93,
       48,76,50,50,173,106,48
PC 850 DATA 73,1,141,106,48,23
       2,236,110,48,208,187,20
       4,111,48,240,53,190,89,
       48
HP 860 DATA 189,81,48,141,68,5
       0,185,125,48,141,221,48
       ,24,169,9,125,81,48,157
BP 870 DATA 81,48,200,32,95,49
       ,169,0,141,109,48,190,8
       9,48,189,81,48,56,233
SH 880 DATA 9,141,106,50,157,8
       1,48,169,0,141,221,48,1
       73,18,208,41,3,24,121
AE 890 DATA 93,48,217,97,48,14
       4,9,153,97,48,185,89,48
       ,153,101,48,169,64,153
SH 900 DATA 93,48,190,89,48,22
       4,7,240,8,152,170,254,8
       9,48,76,100,49,136,48
BX 910 DATA 18,200,152,170,185
       ,97,48,74,202,208,252,1
       36,24,121,93,48,153,93,
       48,96
```

Boldface

Article on page 70.

BEFORE TYPING . . .

Before typing in programs, please refer to "How To Type In COMPUTE!'s GAZETTE Programs," which appears before the Program Listings.

```
GA 10 INPUT"{CLR}{DOWN} FILENA
      ME";FF$:IF FF$="" THEN 1
      0
CS 20 OPEN 4,4,7:OPEN 6,4,6:OP
      EN 8,8,8,"0:"+FF$+",S,R"
GQ 30 GET#8,A$:FL=ST:TL$=TL$+A
      $:PS=PS+1:IF A$=CHR$(13)
       OR PS=80 THEN 50
AJ 40 IF FL=0 THEN 30
JB 50 PRINT#6,CHR$(1):PRINT#4,
      TL$:PRINT#6,CHR$(17):PRI
      NT#4,TL$:TL$="":PS=0
MM 60 IF FL=0 THEN 30
RS 70 CLOSE8:CLOSE6:PRINT#4:PR
      INT#4:CLOSE4:PRINT"END O
      F DOCUMENT"
```

KeyDef

Article on page 71.

```
HC 10 IF PEEK(7166)=175 THEN 5
      0:ELSE POKE 7166,175
AF 20 FAST:BANK15:FORI=0 TO 5:
      K=I:IFI=4THENK=0:ELSEIFI
      =5THENK=4
QJ 30 FORJ=0 TO 88:POKE 5888+I
      *89+J,PEEK(64128+K*89+J)
      :NEXTJ,I
QF 40 BANK0:SLOW
BS 50 FORI=0TO9:K(I)=PEEK(4096
      +I):POKE4096+I,0:NEXT:TR
      AP 180:DIMK$(86):FORI=0T
      O86:READK$(I):NEXT
SF 60 DATA INST/DEL,RETURN,CR
      {SPACE}RT/DN,F7,F1,F3,F5
      ,CR DN/UP,3,W,A,4,Z,S,E,
      ,5,R,D,6,C,F,T,X,7,Y,G,8
      ,B,H,U,V,9,I,J,0,M,K,£,
      N,+,P,L,-,.,":",@,/,O,*,
      ;
QF 70 DATA CLR/HOME,,=,↑,/,1,←
      ,,2,SPACE,,Q,RUN/STOP,HE
      LP,,5,TAB,2,4,7,1,ESC,+,
      -,LF,ENTER,6,9,3,,0,.,CR
       UP,CR DN,CR LT,CR RT
FS 80 FORI=0TO5:A=5888+I*89:PO
      KE830+I*2,AAND255:POKE83
      1+I*2,A/256:NEXT
FG 90 IFRGR(0)=0 THEN COLOR0,1
      :COLOR4,1:COLOR5,13:ELSE
       COLOR 6,1:COLOR 5,4:FAS
      T
CE 100 SCNCLR:PRINTCHR$(11);CH
       R$(14);"KEYDEF
SK 110 PRINT"{DOWN}PRESS KEY T
       O BE REDEFINED:";:DO:A=
       PEEK(213):LOOP UNTIL A<
       88:PRINTK$(A):POKE208,0
SD 120 PRINT"1> UNSHIFTED":PRI
       NT"2> SHIFT":PRINT"3> C
       OMMODORE":PRINT"4> CONT
       ROL":PRINT"5> ALT":PRIN
       T"6> CAPS LOCK"
AX 130 PRINT"WHICH TABLE";:GET
       KEYT$:T=VAL(T$)-1:IF(T<
       0)OR(T>5)THENPRINT:GOTO
       120
GH 140 PRINT"{DOWN}OLD ASCII C
       ODE="PEEK(5888+T*89+A)
GB 150 INPUT"NEW ASCII CODE";C
       :IF C>255 THEN 150:ELSE
        POKE5888+T*89+A,C
GE 160 INPUT"DO ANOTHER KEY
       {2 SPACES}Y{3 LEFT}";A$
       :IFA$="Y"THEN110
FQ 170 FORI=0TO9:POKE4096+I,K(
       I):NEXT:END
FK 180 IF ERR=30 THEN RESUME:E
       LSE PRINT:PRINT"?"ERR$(
       ER)" ERROR IN"EL
```

TurboDisk Relocator

Article on page 66.

```
AB 100 PRINT"{CLR}{WHT}
       {11 SPACES}{RVS}TURBODI
       SK RELOCATOR{OFF}
       {2 DOWN}":OPEN15,8,15
XH 110 OPEN2,8,4,"TBDSK.C000,P
       ,R":GOSUB160
DK 120 GET#2,A$,A$
EF 130 INPUT"NEW BOOT NAME";PN
       $:OPEN1,8,3,PN$+",P,W":
       GOSUB160
DR 140 INPUT"NEW ADDRESS FOR T
       URBODISK";AD:SP=INT(AD/
       256)
PM 150 PRINT#1,CHR$(0);CHR$(SP
       );:GOSUB180:GOSUB190:CL
       OSE1:CLOSE2:END
QA 160 INPUT#15,E,E$,T,S:IFE=0
       THENRETURN
JG 170 PRINTE,E$:CLOSE1:CLOSE2
       :STOP
JE 180 DIM PO(24),VO(24):READN
       :FORX=1TON:READPO(X),VO
       (X):NEXTX:RETURN
FQ 190 N=1:N$=CHR$(0):PRINT"
       {DOWN}{13 RIGHT}{RVS}TA
       RGET{OFF} = 956":FORX=0
       TO956
JF 200 PRINT"{HOME}{6 DOWN}"X:
       GET#2,A$:A=ASC(A$+N$)
XK 210 IFX=PO(N)THEN A=SP+VO(N
       ):PRINT#1,CHR$(A);:N=N+
       1:GOTO230
SX 220 PRINT#1,CHR$(A);
MB 230 NEXTX:RETURN
MM 240 DATA 23,17,0,33,0,104,3
       ,112,3,140,2,167,0,170,
       0,175,0,258,1,261,4
MG 250 DATA 274,4,277,4,286,4,
       291,1,294,1,297,4,304,1
       ,314,4,321,4,326,4
CB 260 DATA 332,1,361,4,431,4
```

Power BASIC: BASIC Line Extender

Article on page 76.

Program 1: BASIC Line Extender—64 Version

```
AQ 10 POKE55,0:POKE56,PEEK(56)
      -1:CLR:AD=PEEK(56)*256:P
      RINT"{CLR}{DOWN}WORKING.
      ..":C=0
QK 20 FORI=ADTOAD+129:READB:C=
      C+B:POKEI,B:NEXT:IFC<>13
      921THENPRINT"DATA ERR":S
      TOP
QF 30 POKEAD+4,PEEK(772):POKEA
      D+5,PEEK(773)
QP 40 POKE773,AD/256:POKE772,A
      D-256*PEEK(773)
PA 50 PRINT"{CLR}{DOWN} "CHR$(
      34)"BASIC LINE EXTENDER"
      CHR$(34)" IS OPERATIONAL
      .":NEW
AG 60 DATA 138,240,3,76,124,16
      5,32,124,165,173,0,2,201
      ,58,240,9,201,92
HF 70 DATA 240,5,201,34,240,1,
      96,132,11,32,19,166,104,
      104,176,3,76,237,164
CB 80 DATA 162,2,134,39,202,17
      3,0,2,201,58,208,3,230,1
      1,202,134,38,160,1,177
JD 90 DATA 95,170,136,177,95,2
      08,1,202,134,96,170,202,
      229,95,24,101,11,144
HG 100 DATA 5,162,23,108,0,3,1
       34,95,165,45,133,90,165
       ,11,233,6,133,11,101,90
JD 110 DATA 133,88,164,46,132,
       91,144,1,200,132,89,32,
       184,163,165,49,164,50
FM 120 DATA 133,45,132,46,164,
       11,177,38,145,95,136,16
       ,249,76,42,165,0
```

Program 2: BASIC Line Extender—Plus/4 and 16 Version

```
JJ 10 AD=828:PRINT"{CLR}{DOWN}
      WORKING...":C=0
FA 20 FORI=ADTOAD+177:READB:C=
      C+B:POKEI,B:NEXT:IFC<>19
      323THENPRINT"DATA ERR":S
      TOP
QF 30 POKEAD+4,PEEK(772):POKEA
      D+5,PEEK(773)
QP 40 POKE773,AD/256:POKE772,A
      D-256*PEEK(773)
PA 50 PRINT"{CLR}{DOWN} "CHR$(
      34)"BASIC LINE EXTENDER"
      CHR$(34)" IS OPERATIONAL
      .":NEW
DC 200 DATA 138,240,3,76,86,13
       7,32,86,137,132,11,162,
       255,232,189,0,2,201,32
MA 210 DATA 240,248,201,48,144
       ,4,201,58,144,240,134,3
       ,189,0,2,201,58,240,9
MH 220 DATA 201,92,240,5,201,3
       4,240,1,96,162,255,232,
       189,0,2,208,250,138,56
DG 230 DATA 229,3,133,4,198,4,
       32,61,138,104,104,176,3
       ,76,133,135,165,4,133
JC 240 DATA 11,162,2,134,39,20
       2,164,3,185,0,2,201,58,
       208,3,230,11,202,138
QP 250 DATA 24,101,3,133,38,16
       0,1,177,95,170,136,177,
       95,208,1,202,134,96,170
QD 260 DATA 202,229,95,24,101,
       11,144,5,162,23,108,0,3
       ,134,95,165,45,133,90
DP 270 DATA 165,11,24,101,90,1
       33,88,164,46,132,91,144
       ,1,200,132,89,32,192,13
       6
CR 280 DATA 165,49,164,50,133,
       45,132,46,164,11,177,38
       ,145,95,136,16,249,32,1
       52
BH 290 DATA 138,32,24,136,76,1
       5,135
```

128 Sprite Rotator

See instructions in article on page 74 before typing in.

BEFORE TYPING . . .

Before typing in programs, please refer to "How To Type In COMPUTE!'s GAZETTE Programs," which appears before the Program Listings.

Program 1: Race Car Demo

```
XP 10 FOR S=1 TO 8 : SPRITE S,
      0 : NEXT S
MR 20 COLOR 0,1 : COLOR 1,4 :
      {SPACE}COLOR 4,5
DE 30 COLOR 5,4 : GRAPHIC 0,1
      {SPACE}: SCALE 0
JE 40 PRINT "{CLR} DEMO ROTATE
      D SPRITES "
XE 50 BLOAD "DRAGSTER.SPR"
AG 60 IF DS THEN PRINT DS$ : S
      TOP
EX 70 PRINT " USE JOYSTICK POR
      T 2"
EA 80 PRINT " PRESS FIRE BUTTO
      N TO QUIT"
KB 90 DIM SS$(8)
SP 100 FOR S=1 TO 8: SPRSAV S,
       SS$(S): NEXT
KD 110 SPRITE 1,1,4,0
DJ 120 MOVSPR 1,150,100
GA 130 DO UNTIL JOY(2) AND 128
MJ 140 : DO WHILE JOY(2) AND 1
       5
MK 150 :{3 SPACES}JS%=JOY(2) A
       ND 15
XC 160 :{3 SPACES}SPRSAV SS$(J
       S%),1
AA 170 :{3 SPACES}ON JS% GOSUB
        210,220,230,240,250,26
       0,270,2780
GQ 180 : LOOP
SP 190 LOOP
MB 200 END
JD 210 MOVSPR 1,+0,-7 : RETURN
HR 220 MOVSPR 1,+5,-5 : RETURN
XB 230 MOVSPR 1,+7,+0 : RETURN
```

```
BR 240 MOVSPR 1,+5,+5 : RETURN
MQ 250 MOVSPR 1,+0,+7 : RETURN
BJ 260 MOVSPR 1,-5,+5 : RETURN
HR 270 MOVSPR 1,-7,+0 : RETURN
HP 280 MOVSPR 1,-5,-5 : RETURN
```

Program 2: Sprite Data

```
0E00:03 8E 00 02 AA 00 02 FA B5
0E08:00 02 AA 00 03 AE 00 00 CC
0E10:20 00 00 20 00 00 70 00 1F
0E18:00 70 00 00 70 00 00 70 44
0E20:00 00 F8 00 00 F8 00 00 3F
0E28:F8 00 F9 FC F8 89 FC 88 40
0E30:8B FE 88 8F FF 88 8B FE 14
0E38:88 89 FC 88 F8 00 F8 43 20
0E40:00 00 00 00 00 00 00 00 5C
0E48:00 00 0C 00 00 1E 00 00 5E
0E50:1E 00 00 0F 80 30 0F C0 10
0E58:68 3B 80 CC F9 00 9B F0 4C
0E60:00 7F E0 00 2F E0 00 0F 84
0E68:C0 00 07 C0 00 03 F0 00 BF
0E70:01 E8 00 00 CC 00 00 98 46
0E78:00 00 70 00 00 20 00 00 23
0E80:FE 00 00 82 00 00 82 00 49
0E88:00 82 00 00 FE 00 00 10 4D
0E90:00 00 38 00 F8 7E 00 88 FD
0E98:7F C0 F8 7F FC 20 7F FF 23
0EA0:F0 7F FC 20 7F C0 F8 7E 26
0EA8:00 88 38 00 F8 10 00 00 F5
0EB0:FE 00 00 82 00 00 82 00 79
0EB8:00 82 00 00 FE 00 00 B8 26
0EC0:00 60 00 00 D0 00 00 88 04
0EC8:00 00 4C 00 03 F8 00 07 71
0ED0:D0 00 0F C0 00 0F C0 00 01
0ED8:6F E0 00 DF E0 00 88 F0 EB
0EE0:00 4C 3B 00 38 1A 80 10 B2
0EE8:07 C0 00 1E 80 00 14 00 C6
0EF0:00 0E 00 00 04 00 00 00 B0
0EF8:00 00 00 00 00 00 00 FF 15
0F00:F8 00 F8 89 FC 88 8B FE 72
0F08:88 8F FF 88 8B FE 88 89 C9
0F10:FC 88 F9 FC F8 00 F8 00 97
0F18:00 F8 00 00 F8 00 00 70 AC
0F20:00 00 70 00 00 70 00 00 0E
0F28:70 00 00 20 00 00 20 00 C0
0F30:03 AE 00 02 AA 00 02 FA EF
0F38:00 02 AA 00 03 8E 00 43 C1
0F40:00 60 00 00 D0 00 01 98 97
0F48:00 01 30 00 00 FC 00 00 A0
0F50:5E 00 00 3F 00 00 3F 80 90
0F58:00 7F E0 00 7F D0 00 F9 AB
0F60:98 0C E1 30 1F C0 E0 1F E9
0F68:00 40 0F 80 00 03 C0 00 0E
0F70:03 80 00 01 00 00 00 00 40
0F78:00 00 00 00 00 00 00 00 96
0F80:00 03 F8 00 02 08 00 02 B0
0F88:08 00 02 08 00 03 F8 00 69
0F90:00 40 F8 00 E0 88 03 F0 FD
0F98:F8 1F F0 21 FF F0 7F FF ED
0FA0:F0 21 FF F0 F8 1F F0 88 3D
0FA8:03 F0 F8 00 E0 00 00 40 EA
0FB0:00 03 F8 00 02 08 00 02 E0
0FB8:08 00 02 08 00 03 F8 BC 56
0FC0:00 00 00 00 00 00 00 00 DE
0FC8:00 03 00 00 02 80 00 07 C0
0FD0:C0 00 1E 80 00 15 00 C0 30
0FD8:0E C1 A0 04 F1 10 00 7C 0F
0FE0:98 00 7F F0 00 3F A0 00 88
0FE8:3F 80 00 1F 00 00 DE 00 76
0FF0:01 BC 00 01 10 00 00 98 E7
0FF8:00 00 70 00 00 20 00 FF A5
```

Program 3: Sprite Rotator

```
XP 10 FOR S=1 TO 8:SPRITE S,0:
      NEXT S
MR 20 COLOR 0,1:COLOR 1,4:COLO
      R 4,5
QS 30 COLOR 5,4:GRAPHIC 0,1
FF 40 PRINT "{DOWN} HI-RES SPR
      ITE ROTATOR{DOWN}"
DC 50 INPUT " WHICH SPRITE (1-
      8){2 SPACES}1{3 LEFT}";S
      %
RC 60 IF S%<1 OR S%>8 THEN 50
JQ 70 IF RSPRITE(S%,5)=1 THEN
      {SPACE}PRINT"{DOWN} SORR
      Y, CAN'T ROTATE MULTI-CO
      LOR SPRITE.":STOP
GS 80 INPUT "{DOWN} OK TO ERAS
      E OTHER SPRITES
      {3 SPACES}Y{3 LEFT}"; A$
       : IF LEFT$(A$,1)<>"Y" T
      HEN STOP
BF 90 PRINT " FOR 45 DEGREE SP
      RITES:{DOWN}"
GH 100 PRINT " 1. REDUCE SIZE
       {SPACE}TO FIT"
ER 110 PRINT " 2. KEEP SAME SI
       ZE"
HM 120 PRINT " 3. ENLARGE SIZE
       {DOWN}"
CG 130 INPUT " YOUR CHOICE (1-
       3){2 SPACES}1{3 LEFT}";
       SC%
HE 140 IF SC%<1 OR SC%>3 THEN
       {SPACE}130
AM 150 ON SC% GOTO 160,170,180
AA 160 Y0=50:SC=.5: GOTO 190
SQ 170 Y0=46:SC=1/SQR(2):GOTO
       {SPACE}190
DA 180 Y0=40:SC=1
FJ 190 X0=20
QM 200 A$="":INPUT "{DOWN} FAS
       T MODE{3 SPACES}N
       {3 LEFT}";A$
QM 210 IF LEFT$(A$,1)="Y" THEN
        FAST
BX 220 TRAP 720
HG 230 GRAPHIC 1,1:SCALE 0
KD 240 SPRSAV S%,1:SSHAPE MT$,
       1,1,24,21
SM 250 FOR S=2 TO 8:SPRSAV MT$
       ,S:NEXT S
BS 260 FOR S=1 TO 8
PQ 270 MOVSPR S,215,130
GX 280 MOVSPR S,75; S*45-45
AK 290 SPRITE S,1,S+1,1,1,1,0
XR 300 NEXT S
QA 310 SPRSAV 1,S$:GOSUB 500:S
       PRSAV S$,2
HC 320 SPRSAV 1,S$:GOSUB 400:S
       PRSAV S$,3
KK 330 SPRSAV 3,S$:GOSUB 500:S
       PRSAV S$,4
GP 340 SPRSAV 3,S$:GOSUB 400:S
       PRSAV S$,5
PS 350 SPRSAV 5,S$:GOSUB 500:S
       PRSAV S$,6
AA 360 SPRSAV 5,S$:GOSUB 400:S
       PRSAV S$,7
FH 370 SPRSAV 7,S$:GOSUB 500:S
       PRSAV S$,8
PQ 380 SLOW:GOSUB 630
PS 390 END
QJ 400 REM{15 SPACES}ROTATE 90
        DEGREES
JQ 410 GOSUB 580
AR 420 FOR X=10 TO 30
FQ 430 FOR Y=10 TO 30
CK 440 LOCATE X,Y
KP 450 IF RDOT(2) THEN DRAW 1,
       40-Y,X+40
RP 460 NEXT Y
KP 470 NEXT X
RX 480 GOSUB 620:RETURN
QH 490 REM{15 SPACES}ROTATE 45
        DEGREES
MD 500 GOSUB 570
AD 510 FOR X=0 TO 20
FC 520 FOR Y=0 TO 20
MH 530 LOCATE X+10,Y+10
BK 540 IF RDOT(2) THEN DRAW 1,
       X0+(X-Y)*SC,Y0+(X+Y)*SC
EB 550 NEXT Y,X
PC 560 GOSUB 620:RETURN
KM 570 REM{2 SPACES}STAMP SPRI
       TE AND CLEAR NEW AREA
AE 580 GSHAPE S$,10,10
SE 590 BOX 1,9,49,34,71
EJ 600 GSHAPE MT$,10,50:RETURN
QK 610 REM{8 SPACES}LIFT NEW S
       HAPE OFF SCREEN
KA 620 SSHAPE S$,10,50,33,70:R
       ETURN
BP 630 CHAR 1,1,24,"PRESS ANY
       {SPACE}KEY..."
FP 640 DO: GET A$: LOOP UNTIL
       {SPACE}A$=""
AJ 650 GETKEY A$
MH 660 FOR S=1 TO 8:SPRITE S,0
       :NEXT S
CR 670 GRAPHIC 0,1:GRAPHIC CLR
DK 680 PRINT "{3 DOWN}BSAVE "+
       CHR$(34)+"FILENAME.SPR"
       +CHR$(34)+",B0,P3584 TO
        P4096"
JB 690 PRINT CHR$(19)
RA 700 RETURN
CP 710 REM{20 SPACES}TRAP ROUT
       INE
HC 720 GRAPHIC 0 : SLOW
JA 730 PRINT "{DOWN}?" ERR$(ER
       );
CP 740 IF ER<>30 THEN PRINT "
       {SPACE}ERROR ";
GA 750 PRINT "IN" EL
GK 760 HELP
MD 770 STOP
```

Kaleidoscope Revisited

Article on page 75.

Program 1: Kaleidoscope Revisited—64 Version

```
MK 10 SI=15:M=54272:FORN=MTOM+
      23:POKEN,0:NEXT:POKEM+24
      ,15:POKEM+5,129:POKEM+6,
      129
EJ 20 POKEM+4,17
DE 30 FORI=0TO7:READM(I):NEXT:
      DATA1,4,25,128,2,10,60,2
      55
BK 40 POKE53280,0:POKE53281,0:
      PRINT"{YEL}":GOSUB550
SC 50 REM ML ADDRESSES
XR 60 KAL=49664:A=49696:CHAR=2
      51:X=253:Y=254
GQ 70 SEED=KAL+126:POKESEED,25
      5*RND(-TI)+1
BD 80 POKESEED+1,256*RND(1):PO
      KEX,0:POKEY,0:POKECHAR,2
      28:GOSUB350
FR 90 REM INTRO PAGE
SA 100 PRINT"{CLR}{5 DOWN}
       {15 SPACES}WELCOME TO
       {2 DOWN}":PRINT"
       {13 SPACES}UCCCCCCCCCC
       CI"
AQ 110 PRINT"{13 SPACES}-KALEI
       DOSCOPE-"
CK 120 PRINT"{13 SPACES}J*****
       *******K{4 DOWN}"
XB 130 PRINT"{8 SPACES}PRESS A
       NY KEY TO CONTINUE"
GG 140 GOSUB370:POKEA,25:GOTO4
       10
EF 150 REM MAIN LOOP
PE 160 IFA$="R"THENGOSUB1060
```

```
KM 170 SYSKAL:POKEM+1,RND(1)*5
       5+5:FORI=1TOD:NEXT:GETA
       $:IFA$=""THEN170
PA 180 V=VAL(A$):IFA$="0"THEND
       =1
FC 190 IFV>0THEND=2.4↑V
HS 200 IFA$="Q"THENGOSUB1070:E
       ND
RA 210 FORI=0TO7:IFA$=CHR$(133
       +I)THENPOKEA,M(I)
BH 220 NEXTI:IFA$="B"THENGOSUB
       330
XH 230 IFA$="C"THENGOSUB350
PA 240 IFA$=CHR$(19)THENPRINTC
       HR$(147):GOTO170
XS 250 IFA$="H"THENGOSUB1070:G
       OTO410
SG 260 IFA$=" "THENGOSUB370
JJ 270 IFA$="P"ANDPEEK(49692)=
       1THENGOSUB1080:WAIT198,
       1
PQ 280 IFA$="D"ANDPEEK(49692)=
       1THENFG=1:GOSUB1080:WAI
       T198,1
EM 290 IFA$="S"THENSI=ABS(SI-1
       5):POKEM+24,SI
EG 300 IFA$="P"THENGOSUB1010:P
       OKEM+24,SI
XH 310 GOTO160
AG 320 REM BLACK AND WHITE
QF 330 POKE53280,11:POKE53281,
       11:POKE49692,1:RETURN
HK 340 REM COLOR
EJ 350 POKE53280,0:POKE53281,0
       :POKE49692,15:RETURN
CF 360 REM HIT ANY
AM 370 GETA$:IFA$<>""THEN370
GC 380 GETA$:IFA$=""THEN380
PX 390 RETURN
CA 400 REM HELP MESSAGE
GP 410 PRINT"{CLR}{17 SPACES}C
       ONTROLS{DOWN}
PD 420 PRINT"{2 SPACES}SHIFT-P
       /D{3 SPACES}: PRINT/2-W
       IDE (B/W ONLY)"
DB 430 PRINT"{DOWN}F1 THROUGH
       {SPACE}F8 : CONTROL COM
       PLEXITY{DOWN}"
HS 440 PRINT" 0 THROUGH 9
       {2 SPACES}: CONTROL SPE
       ED{DOWN}"
PR 450 PRINT"{5 SPACES}B/C
       {6 SPACES}: BLACK AND W
       HITE/COLOR{DOWN}"
PR 460 PRINT"{4 SPACES}SPACE
       {5 SPACES}: FREEZE DISP
       LAY"
SQ 470 PRINT"{DOWN}{5 SPACES}C
       LR{6 SPACES}: CLEAR SCR
       EEN":PRINT"{DOWN}
       {6 SPACES}H{7 SPACES}:
       {SPACE}HELP!"
JA 480 PRINT"{DOWN}{6 SPACES}S
       {7 SPACES}: SILENCE TOG
       GLE"
JG 490 PRINT"{DOWN}{6 SPACES}P
       {7 SPACES}: PROGRAM CHA
       RACTER"
FC 500 PRINT"{DOWN}{6 SPACES}R
       {7 SPACES}: RANDOMIZED
       {SPACE}CHARACTERS{DOWN}
       "
MJ 510 PRINT"{6 SPACES}Q
       {7 SPACES}: QUIT"
PC 520 PRINT"{DOWN} HIT ANY KE
       Y TO START THE KALEIDOS
       COPE{HOME}":GOSUB370:PR
       INTCHR$(147)
DF 530 GOTO170
QA 540 REM LOAD ML
DJ 550 PRINTCHR$(147)"...LOADI
       NG ML"
PH 560 S=0:C=49664:FORI=CTOC+2
       48:READX:POKEI,X:S=S+X:
       NEXT
SD 570 IFS<>33124THENPRINT"ERR
       OR IN DATA STATEMENTS":
       END
QP 580 RETURN
QK 590 DATA 173,32,194,133,165
       ,32
KB 600 DATA33,194,32,90,194,32
HJ 610 DATA33,194,32,90,194,19
       8
SX 620 DATA165,208,240,238,240
       ,193
PD 630 DATA173,240,193,41,15,1
       33
CJ 640 DATA252,96,25,32,43,194
MM 650 DATA32,65,194,32,43,194
AP 660 DATA96,32,172,194,32,74
MF 670 DATA194,32,172,194,32,8
       2
CH 680 DATA194,32,172,194,32,7
       4
QQ 690 DATA194,32,172,194,96,1
       65
AD 700 DATA253,164,254,133,254
       ,132
JG 710 DATA253,96,169,24,56,22
       9
MG 720 DATA253,133,253,96,169,
       24
RC 730 DATA56,229,254,133,254,
       96
DX 740 DATA32,109,194,144,7,32
QA 750 DATA109,194,144,28,176,
       35
GH 760 DATA32,109,194,144,43,1
       76
MD 770 DATA50,14,127,194,46,12
       6
QR 780 DATA194,144,8,173,127,1
       94
MB 790 DATA73,45,141,127,194,9
       6
CE 800 DATA109,12,198,253,16,4
AP 810 DATA169,24,133,253,96,2
       30
DM 820 DATA253,165,253,201,25,
       208
CQ 830 DATA4,169,0,133,253,96
DX 840 DATA198,254,16,4,169,24
MF 850 DATA133,254,96,230,254,
       165
AS 860 DATA254,201,25,208,4,16
       9
RX 870 DATA0,133,254,96,32,193
HC 880 DATA194,165,251,160,0,1
       45
KE 890 DATA163,169,212,24,101,
       164
JS 900 DATA133,164,165,252,145
       ,163
XB 910 DATA96,169,4,133,164,16
       5
BA 920 DATA253,24,105,7,133,16
       3
DQ 930 DATA166,254,160,0,32,23
       0
JR 940 DATA194,32,230,194,32,2
       30
MF 950 DATA194,32,237,194,32,2
       30
DD 960 DATA194,32,230,194,32,2
       37
CG 970 DATA194,96,138,10,170,1
       52
MP 980 DATA42,168,96,24,138,10
       1
QH 990 DATA163,133,163,152,101
       ,164
GS 1000 DATA133,164,96
SS 1010 GOSUB1070:PRINT"{HOME}
        {5 DOWN}{6 SPACES}:
        {7 LEFT}";:INPUT"#";NU
        $:IFNU$="R{2 SPACES}"T
        HEN1040
EX 1020 NU=VAL(NU$):IFNU<0ORNU
        >255THEN1010
QX 1030 POKECHAR,NU
AM 1040 PRINT"{HOME}{5 DOWN}
        {7 SPACES}":PRINT"
        {14 SPACES}"
AD 1050 RETURN
HQ 1060 POKECHAR,PEEK(162):RET
        URN
KX 1070 POKEM+24,0:RETURN
CC 1080 SS=55303:CC=40:RR=24:W
        W=25:GOSUB1070
RG 1090 OPEN4,4:FORG=0TORR:PRI
        NT#4,CHR$(15);
DC 1100 IFFGTHENFORF=1TO2:PRIN
        T#4,CHR$(14);
KC 1110 FORN=SS+G*CCTOSS+G*CC+
        WW:Q=PEEK(N)
BM 1120 IF(QAND15)=1THENPRINT#
        4,"X";
HA 1130 IF(QAND15)<>1THENPRINT
        #4," ";
HD 1140 NEXTN:PRINT#4,CHR$(8):
        IFFGTHENNEXTF
AA 1150 NEXTG:FORN=1TO4:PRINT#
        4:NEXT:CLOSE4:FG=0:RET
        URN
```

Program 2: Kaleidoscope Revisited—Plus/4 and 16 Version

```
HR 10 POKE56,60:CLR:FORI=0TO7:
      READM(I):NEXT:DATA1,2,4,
      10,25,60,128,255
EG 20 FORI=1TO8:KEYI,CHR$(132+
      I):NEXT:COLOR0,1:COLOR4,
      1:VL=8:PRINT"{YEL}":GOSU
      B520
SH 30 REM * ML ROUTINE ADDRESS
      ES *
PR 40 KAL=15617:A=15651:CH=3:X
      =5:Y=6
QX 50 SEED=KAL+128:POKESEED,25
      5*RND(-TI)+1:REM * SEED
      {SPACE}RANDOM # GEN *
QB 60 POKESEED+1,256*RND(1):PO
      KEX,0:POKEY,0:POKECH,228
      :GOSUB320
SR 70 REM * INTRO PAGE *
PK 80 PRINT"{CLR}{5 DOWN}
      {15 SPACES}WELCOME TO
      {2 DOWN}":PRINT"
      {13 SPACES}UCCCCCCCCCCC
      I"
FB 90 PRINT"{13 SPACES}-KALEID
      OSCOPE-"
PE 100 PRINT"{13 SPACES}J*****
       *******K{4 DOWN}":PRINT
       "{8 SPACES}PRESS ANY KE
       Y TO CONTINUE"
BA 110 GOSUB340:POKEA,25:GOTO3
       80
KG 120 REM * MAIN LOOP *
RR 130 IFA$="R"THENGOSUB1030
HE 140 SYSKAL:VOLVL:SOUND 1,IN
       T(RND(1)*1024),10:FORI=
       1TOD:NEXT:GETA$:IFA$=""
       THEN140
XG 150 V=VAL(A$):IFA$="0"THEND
       =1
AQ 160 IFV>0THEND=2.4↑V
BS 170 IFA$="Q"THENEND
SD 180 FORI=0TO7:IFA$=CHR$(133
       +I)THENPOKEA,M(I)
HR 190 NEXTI:IFA$="B"THENGOSUB
       300
GK 200 IFA$="C"THENGOSUB320
```

```
JS 210 IFA$=CHR$(19)THENPRINTC
       HR$(147):GOTO140
GP 220 IFA$="H"THEN380
BJ 230 IFA$=" "THENGOSUB340
SG 240 IFA$="P"ANDPEEK(15645)=
       112THENGOSUB1040:WAIT23
       9,1
HB 250 IFA$="D"ANDPEEK(15645)=
       112THENFG=1:GOSUB1040:W
       AIT239,1
HG 260 IFA$="S"THENVL=-(VL=0)*
       8:VOLVL
QS 270 IFA$="P"THENGOSUB980
PE 280 GOTO130
AP 290 REM * BLACK AND WHITE *
PC 300 COLOR 0,2,3:COLOR 4,2,3
       :POKE15645,112:POKE1564
       7,113:RETURN
XD 310 REM * COLOR *
JP 320 COLOR 0,1:COLOR 4,1:POK
       E15645,0:POKE15647,127:
       RETURN
JH 330 REM * HIT ANY *
PD 340 GETA$:IFA$<>""THEN340
AE 350 GETA$:IFA$=""THEN350
XR 360 RETURN
EM 370 REM * HELP MESSAGE *
XB 380 PRINT"{CLR}{14 SPACES}C
       ONTROLS{DOWN}"
JC 390 PRINT"{2 SPACES}SHIFT-P
       /D{3 SPACES}: PRINT/2-W
       IDE (B/W ONLY)"
SX 400 PRINT"{DOWN}F1 THROUGH
       {SPACE}F8 : CONTROL COM
       PLEXITY{DOWN}"
CR 410 PRINT" 0 THROUGH
       {2 SPACES}9 : CONTROL S
       PEED{DOWN}"
XP 420 PRINT"{5 SPACES}B/C
       {6 SPACES}: BLACK AND W
       HITE/COLOR{DOWN}"
QD 430 PRINT"{4 SPACES}SPACE
       {5 SPACES}: FREEZE DISP
       LAY"
DD 440 PRINT"{DOWN}{5 SPACES}C
       LR{6 SPACES}: CLEAR SCR
       EEN":PRINT"{DOWN}
       {6 SPACES}H{7 SPACES}:
       {SPACE}HELP!"
EG 450 PRINT"{DOWN}{6 SPACES}S
       {7 SPACES}: SILENCE TOG
       GLE"
QJ 460 PRINT"{DOWN}{6 SPACES}P
       {7 SPACES}: PROGRAM CHA
       RACTER"
ED 470 PRINT"{DOWN}{6 SPACES}R
       {7 SPACES}: RANDOMIZED
       {SPACE}CHARACTERS{DOWN}
       "
KK 480 PRINT"{6 SPACES}Q
       {7 SPACES}: QUIT"
PG 490 PRINT"{DOWN} HIT ANY KE
       Y TO START THE KALEIDOS
       COPE{HOME}":GOSUB340:PR
       INTCHR$(147)
CB 500 GOTO140
CQ 510 REM * LOAD ML ROUTINES
       {SPACE}*
HM 520 PRINTCHR$(147)"...LOADI
       NG ML"
GD 530 S=0:C=15617:FORI=CTOC+2
       50:READX:POKEI,X:S=S+X:
       NEXT
GQ 540 IFS<>22993THENPRINT"ERR
       OR IN DATA STATEMENTS":
       END
AJ 550 RETURN
JJ 560 DATA 173,35,61,133,162,
       32
PQ 570 DATA 36,61,32,93,61,32
HP 580 DATA 36,61,32,93,61,198
RK 590 DATA 162,208,240,238,0,
       61
BG 600 DATA 173,0,61,9,0,41
MF 610 DATA 127,133,4,96,25,32
AH 620 DATA 46,61,32,68,61,32
AX 630 DATA 46,61,96,32,175,61
CD 640 DATA 32,77,61,32,175,61
DD 650 DATA 32,85,61,32,175,61
MQ 660 DATA 32,77,61,32,175,61
XR 670 DATA 96,165,5,164,6,133
QH 680 DATA 6,132,5,96,169,24
FH 690 DATA 56,229,5,133,5,96
KP 700 DATA 169,24,56,229,6,13
       3
JH 710 DATA 6,96,32,112,61,144
PB 720 DATA 7,32,112,61,144,28
EC 730 DATA 176,35,32,112,61,1
       44
QP 740 DATA 43,176,50,14,130,6
       1
DH 750 DATA 46,129,61,144,8,17
       3
HG 760 DATA 130,61,73,45,141,1
       30
PX 770 DATA 61,96,11,194,198,5
SR 780 DATA 16,4,169,24,133,5
KB 790 DATA 96,230,5,165,5,201
SQ 800 DATA 25,208,4,169,0,133
SE 810 DATA 5,96,198,6,16,4
KH 820 DATA 169,24,133,6,96,23
       0
SX 830 DATA 6,165,6,201,25,208
PQ 840 DATA 4,169,0,133,6,96
QE 850 DATA 32,196,61,165,3,16
       0
XD 860 DATA 0,145,160,169,252,
       24
QB 870 DATA 101,161,133,161,16
       5,4
JH 880 DATA 145,160,96,169,12,
       133
JP 890 DATA 161,165,5,24,105,7
CD 900 DATA 133,160,166,6,160,
       0
DX 910 DATA 32,233,61,32,233,6
       1
AR 920 DATA 32,233,61,32,240,6
       1
PK 930 DATA 32,233,61,32,233,6
       1
MA 940 DATA 32,240,61,96,138,1
       0
MD 950 DATA 170,152,42,168,96,
       24
CX 960 DATA 138,101,160,133,16
       0,152
MX 970 DATA 101,161,133,161,96
QH 980 PRINT"{HOME}{5 DOWN}
       {6 SPACES}:{7 LEFT}";:I
       NPUT"#";NU$:IFNU$="R
       {2 SPACES}"THEN1010
XH 990 NU=VAL(NU$):IFNU<0ORNU>
       255THEN980
QG 1000 POKECH,NU
SE 1010 PRINT"{HOME}{5 DOWN}
        {7 SPACES}":PRINT"
        {14 SPACES}"
SS 1020 RETURN
BB 1030 POKECH,PEEK(165):RETUR
        N
PP 1040 SS=2055:CC=40:RR=24:WW
        =25
KM 1050 OPEN4,4:FORG=0TORR:PRI
        NT#4,CHR$(15);:REM 152
        5, 801, 803 PRINTERS
PA 1060 IFFGTHENFORF=1TO2:PRIN
        T#4,CHR$(14);
BB 1070 FORN=SS+G*CCTOSS+G*CC+
        WW:Q=PEEK(N)
KJ 1080 IF(QAND15)=1THENPRINT#
        4,"X";
XS 1090 IF(QAND15)<>1THENPRINT
        #4," ";
PH 1100 NEXTN:PRINT#4,CHR$(8):
        IFFGTHENNEXTF
QE 1110 NEXTG:FORN=1TO4:PRINT#
        4:NEXT:CLOSE4:FG=0:RET
        URN
```

Program 3: Kaleidoscope Revisited—VIC Version

```
RS 10 POKE56,28:CLR:FORI=0TO7:
      READM(I):NEXT:DATA1,4,25
      ,128,2,10,60,255
MD 20 POKE36879,8:PRINT"{YEL}"
      :VL=15:S1=36875:GOSUB460
QB 30 KAL=7169:A=7201:CH=251:X
      =253:Y=254
SS 40 SE=KAL+126:POKESE,255*RN
      D(-TI)+1
XH 50 POKESE+1,256*RND(1):POKE
      X,0:POKEY,0:POKECH,228:G
      OSUB290
GA 60 PRINT"{CLR}{5 DOWN}
      {6 SPACES}WELCOME TO
      {2 DOWN}":PRINT"
      {4 SPACES}UCCCCCCCCCCCI
      "
FQ 70 PRINT"{4 SPACES}-KALEIDO
      SCOPE-"
JK 80 PRINT"{4 SPACES}J*******
      *****K{4 DOWN}":PRINT"HI
      T A KEY TO CONTINUE"
DS 90 GOSUB300:POKEA,25:GOTO33
      0
EQ 100 IFA$="R"THENGOSUB920
RP 110 POKES1+3,VL:SYSKAL:POKE
       S1,128+RND(1)*128:FORI=
       1TOD:NEXT:GETA$:IFA$=""
       THEN110
DF 120 V=VAL(A$):IFA$="0"THEND
       =1
QX 130 IFV>0THEND=2.4↑V
BG 140 IFA$="Q"THENGOSUB930:EN
       D
CF 150 FORI=0TO7:IFA$=CHR$(133
       +I)THENPOKEA,M(I)
BF 160 NEXTI:IFA$="B"THENGOSUB
       270
BA 170 IFA$="C"THENGOSUB290
AP 180 IFA$=CHR$(19)THENPRINT"
       {CLR}":GOTO110
JG 190 IFA$="H"THENGOSUB930:GO
       TO330
RA 200 IFA$=" "THENGOSUB300
MJ 210 IFA$="P"ANDPEEK(7197)=1
       THENGOSUB940:WAIT198,1
MX 220 IFA$="D"ANDPEEK(7197)=1
       THENFG=1:GOSUB940:WAIT1
       98,1
EP 230 IFA$="S"THENVL=ABS(VL-1
       5):POKES1+3,VL
FD 240 IFA$="P"THENGOSUB880
JA 250 GOTO100
CM 260 REM B&W
AG 270 POKE36879,110:POKE7197,
       1:RETURN
MF 280 REM COLOR
BD 290 POKE36879,8:POKE7197,7:
       RETURN
EP 300 GETA$:IFA$<>""THEN300
KD 310 GETA$:IFA$=""THEN310
XM 320 RETURN
AX 330 PRINT"{CLR}{6 SPACES}CO
       NTROLS"
BC 340 PRINT"{RVS}SHIFT-P/D
       {OFF}:PRINT/2-WIDE";
SS 350 PRINT"{DOWN}{RVS}F1-F8
       {OFF}:ALTER COMPLEXITY"
CH 360 PRINT"{RVS}0-9{OFF}
       {2 SPACES}:ALTER SPEED"
DJ 370 PRINT"{DOWN}{RVS}B{OFF}
       /{RVS}C{OFF}{2 SPACES}:
       B&W OR COLOR"
```

```
FK 380 PRINT"{DOWN}{RVS}SPACE
       {OFF}:FREEZE DISPLAY"
FP 390 PRINT"{DOWN}{RVS}CLR
       {OFF}{2 SPACES}:CLEAR S
       CREEN":PRINT"{DOWN}
       {RVS}H{OFF}{4 SPACES}:H
       ELP!{DOWN}"
CJ 400 PRINT"{RVS}S{OFF}
       {4 SPACES}:SILENCE TOGG
       LE{DOWN}"
SG 410 PRINT"{RVS}P{OFF} :PROG
       RAM A CHARACTER"
XD 420 PRINT"{RVS}R{OFF} :RAND
       OM CHARACTERS{DOWN}"
BP 430 PRINT"{RVS}Q{OFF} :QUIT
       "
KS 440 PRINT"{2 SPACES}HIT A K
       EY TO START{HOME}";:GOS
       UB300:PRINT"{CLR}"
HR 450 GOTO110
QD 460 PRINT"{CLR}...LOADING M
       L":C=7169:FORI=CTOC+231
       :READX:POKEI,X:S=S+X:NE
       XT
HQ 470 IFS<>25910THENPRINT"ERR
       OR IN DATA.":END
BE 480 RETURN
KM 490 DATA 173,33,28,133,165,
       32
MS 500 DATA 34,28,32,91,28,32
GK 510 DATA 34,28,32,91,28,198
QP 520 DATA 165,208,240,238,0,
       28
CP 530 DATA 173,0,28,41,7,133
SC 540 DATA 252,96,128,32,44,2
       8
EG 550 DATA 32,66,28,32,44,28
AQ 560 DATA 96,32,173,28,32,75
QA 570 DATA 28,32,173,28,32,83
GD 580 DATA 28,32,173,28,32,75
PA 590 DATA 28,32,173,28,96,16
       5
HF 600 DATA 253,164,254,133,25
       4,132
QD 610 DATA 253,96,169,20,56,2
       29
MD 620 DATA 253,133,253,96,169
       ,20
AE 630 DATA 56,229,254,133,254
       ,96
RX 640 DATA 32,110,28,144,7,32
SF 650 DATA 110,28,144,28,176,
       35
AX 660 DATA 32,110,28,144,43,1
       76
FJ 670 DATA 50,14,128,28,46,12
       7
RH 680 DATA 28,144,8,173,128,2
       8
BQ 690 DATA 73,45,141,128,28,9
       6
RF 700 DATA 59,172,198,253,16,
       4
KB 710 DATA 169,20,133,253,96,
       230
MG 720 DATA 253,165,253,201,21
       ,208
FG 730 DATA 4,169,0,133,253,96
FM 740 DATA 198,254,16,4,169,2
       0
CQ 750 DATA 133,254,96,230,254
       ,165
PE 760 DATA 254,201,21,208,4,1
       69
AC 770 DATA 0,133,254,96,32,19
       4
JR 780 DATA 28,165,251,160,0,1
       45
AR 790 DATA 163,169,120,24,101
       ,164
RA 800 DATA 133,164,165,252,14
       5,163
MH 810 DATA 96,169,30,133,164,
       165
FD 820 DATA 253,24,105,1,133,1
       63
KF 830 DATA 166,254,160,0,169,
       22
EC 840 DATA 133,2,32,221,28,19
       8
XF 850 DATA 2,208,249,96,24,13
       8
DM 860 DATA 101,163,133,163,15
       2,101
RJ 870 DATA 164,133,164,96
GG 880 GOSUB930:PRINT"{HOME}
       {4 DOWN}{6 SPACES}:
       {7 LEFT}";:INPUT"#";NU$
       :IFNU$="R{2 SPACES}"THE
       N910
ES 890 NU=VAL(NU$):IFNU<0ORNU>
       255THEN880
DR 900 POKECH,NU
BE 910 PRINT"{HOME}{4 DOWN}
       {7 SPACES}":PRINT"
       {14 SPACES}":RETURN
DG 920 POKECH,PEEK(162):RETURN
QQ 930 POKES1+3,0:RETURN
FP 940 SS=38401:CC=22:RR=20:WW
       =20:GOSUB930
HH 950 OPEN4,4:FORG=0TORR:PRIN
       T#4,CHR$(15);:REM 1525,
        801, 803 PRINTERS
EA 960 IFFGTHENFORF=1TO2:PRINT
       #4,CHR$(14);
CB 970 FORN=SS+G*CCTOSS+G*CC+W
       W:Q=PEEK(N)
AJ 980 IF(QAND15)=1THENPRINT#4
       ,"X";
XC 990 IF(QAND15)<>1THENPRINT#
       4," ";
RK 1000 NEXTN:PRINT#4,CHR$(8):
        IFFGTHENNEXTF
HM 1010 NEXTG:FORN=1TO4:PRINT#
        4:NEXT:CLOSE4:FG=0:RET
        URN
```

Expandable Graphics Dump

Article on page 59.

BEFORE TYPING . . .

Before typing in programs, please refer to "How To Type In COMPUTE!'s GAZETTE Programs," which appears before the Program Listings.

Program 1: Expandable Graphics Dump—64 Version

```
MK 100 PRINT"{CLR}{3 DOWN}
       {WHT}"SPC(14)"PLEASE WA
       IT":GOSUB330
EE 110 PRINT"{CLR}SPECIFY GRAP
       HIC SOURCE"
JA 120 PRINT"{2 DOWN}PRESS (1)
        FOR HIRES OTHER THAN
       {20 SPACES}PRINT SHOP"
KM 130 PRINT"{DOWN} OR
       {3 SPACES}(2) FOR PRINT
        SHOP{3 DOWN}"
QQ 140 POKE 198,0:WAIT 198,1:G
       ET GS$:GS=VAL(GS$)
AD 150 IF GS<>1 AND GS<>2 THEN
       140
GD 160 POKE 12272,GS
SJ 170 PRINT"PRESS (1) FOR NOR
       MAL SIZE PRINTOUT"
GS 180 PRINT"{DOWN} OR
       {3 SPACES}(2) FOR ENLAR
       GED PRINTOUT{3 DOWN}"
RG 190 GS=0
PK 200 POKE 198,0:WAIT198,1:GE
       T GS$:GS=VAL(GS$)
QB 210 IF GS<>1 AND GS<>2 THEN
       200
EK 220 IF GS=2 THEN GS=1:GOTO2
       40
AJ 230 GS=0
JG 240 POKE 12274,GS:IF GS THE
       N290
KM 250 PRINT"ENTER SPACE OVER
       {SPACE}VALUE (0-40)"
RH 260 INPUT GS
XS 270 IF GS<0 OR GS>40 THEN25
       0
KM 280 POKE 12273,GS
SP 290 POKE 785,0
CM 300 POKE 786,48
EG 310 X1=USR(0)
SF 320 GOTO110
GG 330 C=0:FOR A=12288 TO 1306
       4:READ B:POKEA,B:C=C+B:
       NEXT:IF C=83337 THEN RE
       TURN
CG 340 PRINT "{CLR}ERROR IN DA
       TA":STOP
MG 350 DATA 173,242,47,201,1,2
       40,23,173,241,47,133,10
       ,24,105,40,141,120,50,3
       2
PS 360 DATA 66,48,32,93,48,32,
       107,48,76,107,49,32,66,
       48,32,93,48,32,107
HP 370 DATA 48,169,0,141,241,4
       7,133,10,169,80,141,120
       ,50,76,121,50,162,8,230
HA 380 DATA 3,208,2,230,4,202,
       208,247,96,173,240,47,2
       01,1,208,5,169,96,76
AQ 390 DATA 80,48,169,64,141,1
       17,50,133,4,169,0,141,1
       16,50,133,3,96,24,165
BQ 400 DATA 3,105,64,133,13,16
       5,4,105,31,133,14,96,16
       9,0,32,189,255,169,4
KD 410 DATA 162,4,160,255,32,1
       86,255,32,192,255,32,20
       4,255,162,4,32,201,255,
       169
DG 420 DATA 13,32,210,255,169,
       0,32,189,255,169,6,162,
       4,160,6,32,186,255,32
PE 430 DATA 192,255,32,204,255
       ,162,6,32,201,255,169,2
       0,32,210,255,169,0,32,1
       89
DS 440 DATA 255,169,5,162,4,16
       0,5,32,186,255,32,192,2
       55,32,204,255,162,4,32
FX 450 DATA 201,255,169,141,32
       ,210,255,96,32,204,255,
       162,5,32,201,255,162,0,
       189
PE 460 DATA 105,50,32,210,255,
       232,224,8,208,245,169,1
       3,32,210,255,32,204,255
       ,162
EX 470 DATA 4,32,201,255,166,1
       0,240,8,169,29,32,210,2
       55,202,208,248,169,254,
       32
CM 480 DATA 210,255,169,141,32
       ,210,255,96,230,10,165,
       10,205,120,50,208,13,17
       3,241
KE 490 DATA 47,133,10,206,96,5
```

```
          0,169,13,32,210,255,96,
          169,0,141,105,50,141,10
          6
XB 500 DATA 50,141,107,50,141,
          108,50,141,109,50,141,1
          10,50,141,111,50,141,11
          2,50
FH 510 DATA 162,0,160,0,185,97
          ,50,61,70,50,240,9,185,
          70,50,29,105,50,157
GR 520 DATA 105,50,200,192,8,2
          40,3,76,52,49,232,224,8
          ,240,3,76,50,49,96
EM 530 DATA 165,3,197,13,208,1
          4,165,4,197,14,208,8,16
          9,15,141,113,50,32,231
MC 540 DATA 255,96,169,0,141,1
          13,50,169,0,141,95,50,1
          60,0,177,3,240,3,238
CF 550 DATA 95,50,153,97,50,20
          0,192,8,208,241,173,95,
          50,208,17,32,255,48,32
HE 560 DATA 54,48,32,86,49,173
          ,113,50,208,12,76,112,4
          9,32,22,49,32,198,48
RD 570 DATA 76,139,49,96,160,0
          ,162,0,173,94,50,208,2,
          160,4,177,3,157,97
BX 580 DATA 50,200,232,224,4,2
          40,3,76,177,49,173,115,
          50,240,3,76,217,49,160
HE 590 DATA 3,185,97,50,74,74,
          74,74,153,97,50,136,48,
          3,76,201,49,160,3
BK 600 DATA 185,97,50,45,114,5
          0,153,97,50,136,48,3,76
          ,219,49,24,173,97,50
SA 610 DATA 109,98,50,109,99,5
          0,109,100,50,240,6,169,
          0,141,95,50,96,169,1
RJ 620 DATA 141,95,50,96,172,1
          00,50,185,78,50,141,104
          ,50,141,103,50,172,99,5
          0
GD 630 DATA 185,78,50,141,102,
          50,141,101,50,172,98,50
          ,185,78,50,141,100,50,1
          41
SD 640 DATA 99,50,172,97,50,18
          5,78,50,141,98,50,141,9
          7,50,96,173,118,50,133
XS 650 DATA 3,173,119,50,133,4
          ,169,0,141,94,50,96,128
          ,64,32,16,8,4,2
XS 660 DATA 1,0,3,12,15,48,51,
          60,63,192,195,204,207,2
          40,243,252,255,192,192
FA 670 DATA 192,192,192,50,15,
          1,0,96,0,126,80,169,0,1
          41,99,50,169,1,15
SG 680 DATA 82,50,141,80,50,16
          5,169,0,141,113,50,169,
          1,141,96,50,141,94,50
BE 690 DATA 165,3,141,118,50,1
          65,4,141,119,50,32,177,
          50,173,94,50,240,6,32
GC 700 DATA 54,50,76,134,50,17
          3,113,50,201,50,240,8,1
          69,1,141,94,50,76,134
ME 710 DATA 50,32,231,255,96,1
          69,0,141,115,50,32,166,
          49,173,95,50,240,3,76
XX 720 DATA 202,50,32,5,50,32,
          22,49,32,198,48,230,10,
          169,1,141,115,50,32
BP 730 DATA 166,49,173,95,50,2
          40,3,76,229,50,32,5,50,
          32,22,49,32,198,48
EJ 740 DATA 32,54,48,32,255,48
          ,173,96,50,208,7,238,96
          ,50,238,113,50,96,169
BH 750 DATA 0,141,115,50,76,18
          2,50,68,65,255,255,255,
          255,255,255,255,255
```

Program 2: Expandable Graphics Dump—128 And Plus/4 Version

```
KJ 10 GRAPHIC1:GRAPHIC0:C=0:PR
         INT"{CLR}{4 DOWN}"SPC(14
         )"PLEASE WAIT":GOSUB180
GF 20 POKE4848,1
MH 30 PRINT"{CLR}{3 DOWN}SPECI
         FY 1:1 OR BLOW-UP"
MR 40 PRINT"(RETURN)=1:1
         {5 SPACES}2.)BLOW-UP
QD 50 GS=0
XS 60 INPUT GS
PK 70 IF GS=2THENGOTO90
BS 80 GS=0:GOTO100
SG 90 GS=1
EK 100 POKE 4850,GS:IFGSTHEN16
          0
XD 110 PRINT"ENTER SPACE OVER
          {SPACE}VALUE (0-40)"
HQ 120 INPUT GS
EC 130 IF GS<0THEN GOTO110
BB 140 IF GS>40THEN GOTO110
DG 150 POKE4849,GS
GE 160 SYS DEC("1300")
MS 170 GOTO20
BC 180 FORA=4864TO5631:READB:C
          =C+B:POKEA,B:NEXT:IFC=7
          7627THENRETURN
XR 190 PRINT"ERROR IN DATA":ST
          OP
RX 200 DATA 173,242,18,201,1,2
          40,23,173,241,18,133,10
          ,24,105,40,141,120,21,3
          2
AA 210 DATA 66,19,32,93,19,32,
          107,19,76,107,20,32,66,
          19,32,93,19,32,107
ME 220 DATA 19,169,0,141,241,1
          8,133,10,169,80,141,120
          ,21,76,121,21,162,8,230
JJ 230 DATA 3,208,2,230,4,202,
          208,247,96,173,240,18,2
          01,1,208,5,169,32,76
AP 240 DATA 80,19,169,32,141,1
          17,21,133,4,169,0,141,1
          16,21,133,3,96,24,165
EP 250 DATA 3,105,64,133.13,16
          5,4,105,31,133,14,96,16
          9,0,32,189,255,169,4
SJ 260 DATA 162,4,160,255,32,1
          86,255,32,192,255,32,20
          4,255,162,4,32,201,255,
          169
BX 270 DATA 13,32,210,255,169,
          0,32,189,255,169,6,162,
          4,160,6,32,186,255,32
CP 280 DATA 192,255,32,204,255
          ,162,6,32,201,255,169,2
          0,32,210,255,169,0,32,1
          89
CK 290 DATA 255,169,5,162,4,16
          0,5,32,186,255,32,192,2
          55,32,204,255,162,4,32
CF 300 DATA 201,255,169,141,32
          ,210,255,96,32,204,255,
          162,5,32,201,255,162,0,
          189
CK 310 DATA 105,21,32,210,255,
          232,224,8,208,245,169,1
          3,32,210,255,32,204,255
          ,162
FF 320 DATA 4,32,201,255,166,1
          0,240,8,169,29,32,210,2
          55,202,208,248,169,254,
          32
KE 330 DATA 210,255,169,141,32
          ,210,255,96,230,10,165,
          10,205,120,21,208,13,17
          3,241
SM 340 DATA 18,133,10,206,96,2
          1,169,13,32,210,255,96,
          169,0,141,105,21,141,10
          6
HC 350 DATA 21,141,107,21,141,
          108,21,141,109,21,141,1
          10,21,141,111,21,141,11
          2,21
PF 360 DATA 162,0,160,0,185,97
          ,21,61,70,21,240,9,185,
          70,21,29,105,21,157
FQ 370 DATA 105,21,200,192,8,2
          40,3,76,52,20,232,224,8
          ,240,3,76,50,20,96
QR 380 DATA 165,3,197,13,208,1
          4,165,4,197,14,208,8,16
          9,15,141,113,21,32,231
PA 390 DATA 255,96,169,0,141,1
          13,21,169,0,141,95,21,1
          60,0,177,3,240,3,238
BB 400 DATA 95,21,153,97,21,20
          0,192,8,208,241,173,95,
          21,208,17,32,255,19,32
SF 410 DATA 54,19,32,86,20,173
          ,113,21,208,12,76,112,2
          0,32,22,20,32,198,19
BE 420 DATA 76,139,20,96,160,0
          ,162,0,173,94,21,208,2,
          160,4,177,3,157,97
PF 430 DATA 21,200,232,224,4,2
          40,3,76,177,20,173,115,
          21,240,3,76,217,20,160
SS 440 DATA 3,185,97,21,74,74,
          74,74,153,97,21,136,48,
          3,76,201,20,160,3
CK 450 DATA 185,97,21,45,114,2
          1,153,97,21,136,48,3,76
          ,219,20,24,173,97,21
KX 460 DATA 109,98,21,109,99,2
          1,109,100,21,240,6,169,
          0,141,95,21,96,169,1
QC 470 DATA 141,95,21,96,172,1
          00,21,185,78,21,141,104
          ,21,141,103,21,172,99,2
          1
FQ 480 DATA 185,78,21,141,102,
          21,141,101,21,172,98,21
          ,185,78,21,141,100,21,1
          41
QH 490 DATA 99,21,172,97,21,18
          5,78,21,141,98,21,141,9
          7,21,96,173,118,21,133
DR 500 DATA 3,173,119,21,133,4
          ,169,0,141,94,21,96,128
          ,64,32,16,8,4,2
RJ 510 DATA 1,0,3,12,15,48,51,
          60,63,192,195,204,207,2
          40,243,252,255,192,192
CM 520 DATA 192,192,192,50,15,
          1,0,96,0,126,80,169,0,1
          41,99,50,169,1,15
BH 530 DATA 82,50,141,80,21,16
          5,169,0,141,113,21,169,
          1,141,96,21,141,94,21
EH 540 DATA 165,3,141,118,21,1
          65,4,141,119,21,32,177,
          21,173,94,21,240,6,32
RP 550 DATA 54,21,76,134,21,17
          3,113,21,201,50,240,8,1
          69,1,141,94,21,76,134
SQ 560 DATA 21,32,231,255,96,1
          69,0,141,115,21,32,166,
          20,173,95,21,240,3,76
QR 570 DATA 202,21,32,5,21,32,
          22,20,32,198,19,230,10,
          169,1,141,115,21,32
BJ 580 DATA 166,20,173,95,21,2
          40,3,76,229,21,32,5,21,
          32,22,20,32,198,19
PP 590 DATA 32,54,19,32,255,19
          ,173,96,21,208,7,238,96
          ,21,238,113,21,96,169
QC 600 DATA 0,141,115,21,76,18
          2,21,68
```

Horizons: Raster Interrupt

Article on page 81.

```
EH 10 FORJ=49152TO49230:READA:
       CK=CK+A:POKEJ,A:NEXT
DM 20 IF CK<>8670THENPRINT"PLE
       ASE CHECK DATA STATEMENT
       S FOR AN ERROR."
GC 30 SYS49152:LIST
DG 100 DATA120,169,28,141,20,3
        ,169,192,141,21,3,169
HF 110 DATA1,141,26,208,169,27
        ,141,17,208,169,127,141
BQ 120 DATA13,220,88,96,169,1,
        141,25,208,173,18,208
AX 130 DATA170,74,74,74,74,141
        ,32,208,74,141,33,208
CP 140 DATA201,7,240,9,138,24,
        105,32,141,18,208,208
SP 150 DATA5,169,16,141,18,208
        ,173,13,220,41,1,240
KD 160 DATA3,76,49,234,76,188,
        254
```

Save Your Copies of COMPUTE!

Protect your back issues of *COMPUTE!* in durable binders or library cases. Each binder or case is custom-made in flag-blue binding with embossed white lettering. Each holds a year of *COMPUTE!*. Order several and keep your issues of *COMPUTE!* neatly organized for quick reference. (These binders make great gifts, too!)

Cases:	**Binders**
$6.95 each;	$8.50 each;
3 for $20.00;	3 for $24.75;
6 for $36.00	6 for $48.00

(Please add $2.50 per unit for orders outside the U.S.)

Send in your prepaid order with the attached coupon

Mail to: Jesse Jones Industries, P.O. Box 5120,
Dept. Code COTE, Philadelphia, PA 19141

Please send me ________ COMPUTE! ☐ cases ☐ binders.
Enclosed is my check or money order for $ ________. (U.S. funds only.)
Name ________
Address ________
City ________
State ________ Zip ________

Satisfaction guaranteed or money refunded.
Please allow 4-6 weeks for delivery.

To Our Readers:

COMPUTE! Publications is a part of the ABC Consumer Magazines group of ABC Publishing, Inc. and recently we consolidated many of our operations and moved our Customer Service Department to the New York ABC headquarters. If you have any questions regarding back issues, disk orders, book orders, or how to place an order, call toll free **1-800-346-6767**. New York residents should call 212-887-8525.

If you want to order a subscription to COMPUTE!, COMPUTE!'s GAZETTE, COMPUTE!'s GAZETTE DISK, or the COMPUTE! DISK, call **1-800-247-5470** or in Iowa call 1-800-532-1272.

Our Editorial Offices remain in Greensboro, North Carolina. If you wish to submit an article for publication, write us at COMPUTE! Publications, Inc., P.O. Box 5406, Greensboro, NC 27403.

We thank you for your interest and continued support of COMPUTE! Publications.

COMPUTE!™ Publications, Inc. abc
Part of ABC Consumer Magazines, Inc.
One of the ABC Publishing Companies

COMPUTE!'s **GAZETTE** Back Issues

Issues not listed are not available.

January 1984: SpeedScript; Graph Plotter; 64 BASIC Aid; Getting Started with a Disk Drive, Part 3

February 1984: Speed Reader; Typing Derby; How to Use Arrays; Auto Line Numbering; Getting Started with a Disk Drive, Part 4

March 1984: Poker; Guess America!; Sea Route to India; Making More Readable Listings; Getting Started with a Disk Drive, Part 5

June 1984: 3-D Tic-Tac-Toe; Castle Dungeon; Spelling Critter; Shape Match; Word Scramble; File Copier

July 1984: Space Patrol; Robot Math; Beginner's Corner; Quilt Squares; Home Telecommunications: Downloading

August 1984: Campaign Manager; Sprite Magic; Sno Cat; Beginner's Corner: Using a Printer; Home Telecommunications: Uploading

October 1984: Trek; Quiz Master; Vocab Builder; VIC Music Tutor; First Aid; Hi-Res Screen Dump

November 1984: C/G Term; Jump; Bagdad; Budgeteer; Function Key; Disk Auto Load

August 1985: Space Dock; Mixing Text and Hi-Res Graphics; Crunch; Creating Hi-Res Graphics on the 64; ReDisk; Hi-Res Toolbox

December 1985: Whirlybird; Quickchange; Banners; The Construction Set; SpeedCheck: Word Processor Spelling Checker; Disk File Archiver

January 1986: Sprint: A Compiler for the 64; Face-Off; The Fast Assembler; Programming Music and Sound on the 128; Disk Disassembler; BASIC Windows

February 1986: Mini-Filer; Kicker; Lexitron; Snapshot; Commodore 128 Memory Map; Disk Editor; Disk Commands on the 128

March 1986: Survivor; Shifter; Number Construction Kit; The Coordinator; Cataloger; Clavier 64; VIC Dump

April 1986: Turbo Copy; Dunk; All About CP/M on the 128; Directory Filer; Windows on the 128; Input Windows

May 1986: Arcade Baseball; Vampyre Hunter; Klondike; Read-A-Tune; Super Synth; Word Counter; Double Load; Coder/Decoder

June 1986: Star Dragon; Predictor; Switcheroo; Solarpix; Quick Key; 64 AutoBoot Maker; Help Screens; SpeedScript-80 for the 128; FontMaker

Back issues are also available for *COMPUTE!'s Gazette Disk*. Each *Disk* back issue costs $12.95 plus $1.00 shipping and handling. Call COMPUTE!'s Customer Service Department for details.

Back issues of COMPUTE!'s GAZETTE are $6 each. All prices include freight in the U.S. Outside the U.S. add $1 per magazine order for surface postage, $4 per magazine for airmail postage. ALL BACK ISSUES ARE SUBJECT TO AVAILABILITY.

In the continental U.S. call
TOLL FREE 800-346-6767
(in NY call 212-887-8525
Or write to:
COMPUTE!'s GAZETTE Back Issues
P.O. Box 5038, F.D.R. Station
New York, NY 10150

Prepayment required in U.S. Funds. MasterCard, VISA, and American Express accepted.
North Carolina residents please add 4½% sales tax.

ABBY'S DISCOUNT SOFTWARE

WE'VE GOT TOP HITS FOR AMIGA

BUSINESS

Textcraft	CALL
Amiga Pascal	CALL
Lattice C Compiler	CALL
Amiga Assembler	CALL
On Line	$49
Bulletin Board System	$79
Calcraft	CALL
Rags to Riches Ledger	CALL
Rags to Riches Payables	CALL
Rags to Riches Receivables	CALL
Rags to Riches Sales	CALL
Enable/Write	CALL
Enable/Calc	CALL
Enable/File	CALL
Scribble	$79
Gizmoz	$49
Analyze Spread Sheet	$79
Marauder	$32
VIP Professional	$129

EDUCATIONAL

French Grammar I	$29
Spanish Grammar I, II & II	ea. $29
Comprehensive Grammar Review I & II	ea. $44
Analogies I & II	ea. $59
Sentence Completion	$34
College Aptitude Reading Comprehension	$59
Practical Composition I, III, IV & V	ea. $35
Practical Composition II	$44
Vocabulary Adventure I, II & III	ea. $49
Reading Adventure I	$29
Reading Adventure II & III	ea. $49
Reading And Thinking I, II & III	ea. $44
Lessons in Reading & Reasoning	$109
U.S. Geography Adventure	$49
World Geography Adventure I, II, III, IV	ea. $49
Speller Bee	$42
Kidtalk	$42

ENTERTAINMENT

Racter	$34
Ballyhoo	$29
Music Studio	$45
Borrowed Time	$29
Mindshadow	$28
Skyfox	$29
Arctic Fox	$30
Financial Cookbook	$35
Seven Cities of Gold	$29
Deluxe Paint	$65
One On One	$29
Deja Vu	CALL
Halley Project	$35
Aegis Draw	CALL
Aegis Animator/Images	CALL
Brataccas	$39
Deluxe Print	$65
Temple of Apshai	$29
Rogue	$29

WE CARRY A COMPLETE LINE OF SOFTWARE.
THE FOLLOWING IS JUST A SAMPLE OF OUR PRODUCTS.

ELECTRONIC ARTS

Music Construction Set	$17
7 Cities of Gold	$24
Adv. Construction Set	$28
Archon	$17
Archon II	$24
Financial Cookbook	$28
One On One	$24
Pinball Construction	$17
Murder/Zinderneuf	$16
Sky Fox	$27
Carriers At War	$39
Heart of Africa	$23
Ultima IV	$49
Moviemaker	$24
Bard's Tale	$28
Lords of Conquest	$29

INFOCOM

Enchanter	$25
Hitchhiker's Guide to the Galaxy	$25
Sorcerer	$27
Invisiclues	each $ 7
Ballyhoo	$29

EPYX

Ballblazer	$26
Rescue on Fractalus	$26
Summer Games II	$26
World Karate Championship	$29
Winter Games	$26
The Eidolon	$26
Koronis Rift	$26
Temple of Apshai Trilogy	$26
Fast Load (R)	$26
Microsoft Multiplan	$49

HARDWARE

1670 Modem	CALL
C-128 Computer	CALL
1571 Disk Drive	CALL
1572 Dual Drive	CALL
1902 Monitor	CALL
MPS 1000 Printer	CALL
VIC 1350 Mouse	CALL
VIC 1700 128-K Expander	CALL

SSI

Kampfgruppe	$35
Operation Market Garden	$30
Computer Quarterback	$24
Battle for Normandy	$24
Broadsides	$24
Gemstone Warrior	$22
Imperium Galactum	$24
Six Gun Shootout	$24
Phantasie I & II	ea. $24
Computer Ambush	$35
Colonial Conquest	$24
Questron	$24
Battalion Commander	$24
Panzer Grenadier	$24
Norway 1985	$22
Fighter Command	$35
Battle of Antietam	$30
U.S.A.A.F.	$35
Battle Group	$35
Rings of Ziflin	CALL

GAMESTAR

Star League Baseball	$19
On Field Football	$19
On Court Tennis	$19
Star Rank Boxing	$19

ABACUS

Ada Training Course	$33
TAS-64	$49
Basic-64	$36
Assembler Monitor-64	$36
Power-Plan	$49
Anatomy of the Commodore (Book)	$18
Anatomy of the Commodore (Disc)	$14
Anatomy of the 1541 (Book)	$18
Anatomy of the 1541 (Disc)	$14
Chart Pak C-64/C-128	$33
Super Pascal C-64/C-128	$48
Super "C" Compiler C-64/C-128	$59

NEW C-128 BOOKS

C-128 Internals	$18
C-128 Tricks & Tips	$18
1571 Internals	$18
CP/M On The C-128	$18

DAVIDSON & ASSOCIATES

Math Blaster!	$34
Word Attack!	$34
Spell It!	$34

MICROPROSE

F-15 Strike Eagle	$25
Kennedy Approach	$25
Decision In The Desert	$27
Crusade In Europe	$27
Acrojet	$25
Silent Service	$25
Gunship	$25
Conflict in Vietnam	$27

MASTERTRONIC

1985 The Day After	$7.95
Action Biker	$7.95
Ant Attack	$7.95
The Black Crystal	$7.95
BMX Racers	$7.95
The Captive	$7.95
Challenger	$7.95
Chiller	$7.95
Count with Oliver	$7.95
Dark Star	$7.95
Finders Keepers	$7.95
Give My Regards to Broad St.	$7.95
Kik Start	$7.95
Look Sharp	$7.95
Make Music with Mister Tronic	$7.95
More Adventures of Big Mac	$7.95
The Quest for the Holy Grail	$7.95
Se-Kaa of Assiah	$7.95
Sky Jet	$7.95
Star Race	$7.95
Vegas Jackpot	$7.95
Magic Carpet	$7.95
Spooks	$7.95
The Last V-8	$7.95
Space Walk	$7.95
Mind Control	$7.95
The Hero of the Golden Talisman	$7.95
Slugger	$7.95
Five-A-Side Soccer	$7.95

SUBLOGIC

Flight Simulator II	$39
Scenery Disk (For Above)	ea. $16
Western U.S. (Disks 1-6)	$79
Jet	$29
Whole Brain Spelling	$24

ACCOLADE

Hardball	$25
Dambusters	$25
Fight Night	$25
Law of the West	$25
PSI-5 Trading Company	$25

ACTIVISION

Alter Ego (M/F)	$35
Borrowed Time	$23
Little Computer People	$23
Fast Tracks	$23
Hacker	$19
Alcazar: The Forgotten Fortress	$19
Great Am. Cross Country Road Race	$19
Countdown to Shutdown	$19
Masters of the Lamps	$19
Mind Shadow	$19
Space Shuttle	$19
Ghostbusters	$23
The Music Studio	$23
Game Maker	$23
Computer Fireworks Celebration Kit	$23
The Designer's Pencil	$19

TOP HITS

CSM1541 Disk Alignment	$39
Paperclip C-64/C-128	CALL
Homepak	$37
Newsroom	$39
Clip Art I & II	ea. $23
Mr. Nibble & MSD Version	$34
Fontmaster II	$29
S'More	$44
Karateka	$22
Fast Hack'em	$33
Sargon III	$35
Copy II - C128	$39
Vizastar XL8/C128	CALL
Merlin 64/128	CALL
Print Master	$27
Art Gallery I	$23
Print Shop	$35
Graphic Library I, II, III	ea. $18
Print Shop Companion	CALL
Home Word/Speller	$54
Leader Board Golf	$29
Tournament Disk (For Above)	$14
Snapshot	$39
10th Frame	$32
GEOS	$49
Kung Fu II	$24
Elite	$25

RIBBONS

Commodore 1525	$7.50
Commodore 1526/802	$7.00
Commodore MPS-801	$7.50
Commodore MPS-803	$9.00
Epson MX/RX/FX-80	$5.00
Okimate 10 - Color	$6.00
Star Powertype	$6.00
Star Gemini 10 - Black	$2.50
Star Gemini 10 - Color	$3.50

TOP QUALITY BULK DISKS

100 Quality DSDD	ea. 69¢
100 Quality SSDD	ea. 59¢
Less Than 100 — DSDD	ea. 79¢
Less Than 100 — SSDD	ea. 69¢

WE CARRY A FULL LINE OF PANASONIC, STAR, EPSON, OKIDATA AND LEGEND PRINTERS. CALL FOR CURRENT PRICES.

ALL TITLES ON DISK UNLESS MARKED (R) FOR ROM CARTRIDGE

WE CHECK FOR STOLEN VISA & MASTERCARD

Order Line
1-800-282-0333
ORDERS ONLY! Sales Personnel Do Not Have Information on Previous Orders or Product Specs.

M-F 10 a.m.-8 p.m.; Sat. 10-3 ET

37 S. Broad Street, Fairborn, OH 45324

Customer Service & Ohio Residents
1-513-879-9699

AD #G-086

VISA

SOFTWARE ONLY — Prepaid orders over $50 receive free shipping via UPS in continental U.S. Please add $2 orders under $50. HARDWARE and all orders requiring shipment via U.S. Post Office are subject to additional freight charges. Add $5 for COD orders. VISA/MasterCard orders add $2 service charge. Ohio residents add 5.5% sales tax. Personal checks require a three-week waiting period. No waiting when paid by credit card, certified check or money order. All items subject to availability and price change. PLEASE CITE AD NUMBER WHEN ORDERING. ALL RETURNS MUST BE ACCOMPANIED BY AN AUTHORIZATION NUMBER.

MasterCard

THE COMMODORE CONNECTION

commodore 64 System

INCLUDES:

- CB64 Computer
- CB1541 Disk Drive
- Taxan 220 Color Monitor

$499.00

AMIGA System

Includes:

AMIGA 1000 CPU, 512K, Amiga RGB Monitor

$1399.00

commodore 128 System

INCLUDES:

- CB128 Computer
- CB1571 Disk Drive
- Magnavox 8562 RGB/ Composite Monitor

$779.00

SOFTWARE

ATARISOFT/Commodore	
PacMan	$4.99
Centipede	$4.99
Galaxian	$4.99
Defender	$4.99
Dig Dug	$4.99
Donkey Kong	$4.99
Robotron	$4.99
BATTERIES INCLUDED	
Paperclip 64/128	$37.99
Paperclip/Spell Pak	$49.99
Spell Pak	$29.99
The Consultant	$37.99
HomePak	$29.99
BRODERBUND	
The Print Shop	$29.99
Graphics Library 1,2,3 ea	$17.99
The Music Shop	$29.99
Bank Street Writer	$34.99
Graphics Companion	$24.99
CARDCO	
Freeze Frame	$29.99
S'more Basic	$44.99

COMMODORE	
Jane-integrated	$39.99
Assembler 64	$9.99
Pilot 64	$9.99
Super Expander	$9.99
DATA SOFT	
Moon Shuttle	$5.99
Pooyan	$5.99
O'Riley's Mine	$5.99
DISCOVERY	
Marauder Amiga B/U	$32.99
HES	
Omniwriter	$19.99
Benji Space Rescue	$3.99
HES Games/Olympics	$3.99
Graphics Basic	$3.99
MEGASOFT for Amiga	
A-Copier	$34.99
A-Report	$44.99
Text Craft	$59.99
Graphic Craft	$29.99

MICRO SYSTEMS	
Analyze for Amiga	$59.99
Scribble	$79.99
On-Line	$59.99
Professional Software	
Fleet Systems II C128/64	$49.99
Fleet Systems III C128	$59.99
Trivia Fever	$19.99
PFS	
File	$32.99
SPRINGBOARD	
The News Room	$32.99
Clip Arts	$19.99
Clip Arts II	$27.99
SUBLOGIC	
Flight Simulator II	$37.99
Jet Simulator C64	$37.99
SPINNAKER	
Rhymes & Riddles	$9.99
Alf Cocor Caves	$7.99
Bubble Burst	$9.99
Snooper Trooper's #1	$9.99

MODEMS

Anchor Volksmodem	$59.99
Anchor 6480 (64/128) 300/1200 Baud	$139.00
CBM 1660 (C-64)	$59.99
CBM 1670 (C-128)	$179.00

DRIVES

CBM1541	$199.00
CBM1571	$249.00
MSD-1	$219.00
MSD-2	$459.00
INDUS-GT (64/128)	$199.00

PRINTERS

COMREX CR-220	$89.99
EPSON Homewriter 10	$159.00
OKIDATA Okimate 10	$199.00
STAR SL10C	$219.00
PANASONIC 1080	$199.00
C.ITOH 7500 AP	$169.00

INTERFACES

CARDCO G-WHIZ	$49.99
CARDCO Super G	$52.99
Digital Devices U-Print C	$44.99
Orange Micro Grappler CD	$89.99
PPI Printer Interface	$34.99
Xetec 8K	$69.99
Micro R & D MJ350	$59.99

ACCESSORIES

CompuGuard Protector	$14.99
Curtis SP2 Protector	$39.99
Curtis Safety Strip	$19.99
Computer Specialties Power Plus	$54.99

MONITORS

COLOR/COMPOSITE	
Taxan 220	$179.00
MONOCHROME	
NEC 1205 Amber with audio	$79.99

DISKETTES

MAXELL MD1	$11.99
NASHUA SS/DD	$9.99
ELEPHANT SS/DD	$9.99
GENERIC DS/DD w/Flip'n File 10 Disk Holder	$11.99
AMARAY	
Disk Tubs	$9.99

COMPUTER MAIL ORDER

CALL TOLL-FREE 1-800-233-8950

477 East Third Street, **Dept. A408,** Williamsport, PA 17701

EDUCATIONAL INSTITUTIONS CALL TOLL-FREE 1-800-221-4283

POLICY: Add 3% (Minimum $7.00) shipping and handling. Larger shipments may require additional charges. Personal and company checks require 3 weeks to clear. For faster delivery use your credit card or send cashier's check or bank money order. Pennsylvania residents add 6% sales tax. All prices are subject to change and all items are subject to availability. Defective software will be replaced with the same item only. Hardware will be repaired or replaced at our discretion within the the terms and limits of the manufacturer's warranty. We cannot guarantee compatibility. All sales are final and returned shipments are subject to a restocking fee.

1-800-268-3974
Ontario/Quebec

1-800-268-4559
Other Provinces

CANADIAN ORDERS
All prices shown are for U.S.A. orders
Call the Canadian Office for Can. prices

1-416-828-0866
In Toronto

Telex:06-218960
2505 Dunwin Drive,
Mississauga, Ontario
Canada L5L1T1

ATTENTION

ALL COMMODORE 64, VIC 20, COMM. 16 AND COMMODORE 128 OWNERS

A complete self-tutoring BASIC programming course is now available. This course starts with turning your computer on, to programming just about anything you want! This course is currently used in both High School and Adult Evening Education classes and has also formed the basis of teacher literacy programs. Written by a teacher, who after having taught the course several times, has put together one of the finest programming courses available today. This complete 13 lesson course of over 220 pages is now available for the COMMODORE 64, VIC 20, COMMODORE 16 and the COMMODORE 128 and takes you step by step thru a discovery approach to programming and you can do it all in your leisure time! The lessons are filled with examples and easy to understand explanations as well as many programs for you to make up. At the end of each lesson is a test of the information presented. Furthermore, ALL answers are supplied to all the questions and programs, including the answers to the tests. Follow this course step by step, lesson by lesson, and turn yourself into a real programmer! You won't be disappointed!

We will send this COMPLETE course to you at once for just $19.95 plus $3.00 for shipping and handling (U.S. residents, please pay in U.S. funds). If you are not COMPLETELY satisfied, then simply return the course within 10 days of receipt for a FULL refund.

FOLLOW UP COURSE

Now available! a 200 page course exclusively on sequential and relative files using a unique approach for those with very limited file programming experience - set up your own personal and business records! — disk drive a must — same author — same guarantee — same cost— this course for all computers except Vic 20.

Fill in the coupon or send a facsimile.

CG

NAME:____________________________

ADDRESS:__________________________

CITY:_____________________________

PROV./STATE:________________________

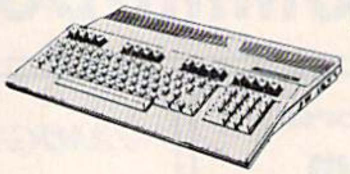
POSTAL/ZIP CODE:____________________

I desire the BASIC programming course for:
Commodore 64 ☐ **Vic 20** ☐
Comm. 128 ☐ **Comm. 16** ☐
I desire the FOLLOW-UP ☐ **course on relative and sequential files for all above computers but Vic 20).**

Any complete course:	**$19.95**
Postage and Handling:	**$3.00**
Total:	**$22.95**

Send Cheque or Money Order to:
Brantford Educational Services
6 Pioneer Place,
Brantford, Ontario,
Canada N3R 7G7

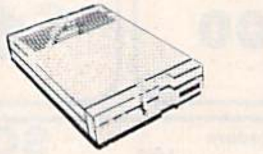
COMMODORE 128



PERSONAL COMPUTER

CALL

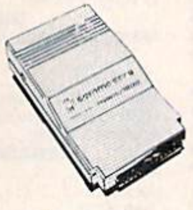
COMMODORE 1571



DISK DRIVE

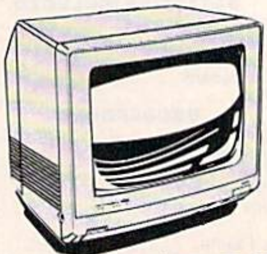
$229

1670 MODEM



$159

1902 MONITOR

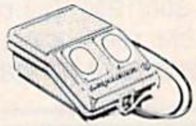


$289

CALL FOR SUPER PACKAGE PRICES

1350 MOUSE

ONLY $42.95



EST. 1982

ComputAbility™

P.O. BOX 17882
MILWAUKEE, WI 53217

ORDER LINES OPEN
MON - FRI 11 A.M. - 7 P.M. CST
SAT 12 P.M. - 5 P.M. CST

TO ORDER CALL TOLL FREE
800-558-0003

FOR TECHNICAL INFORMATION, ORDER INQUIRIES, OR FOR WIS. ORDERS
414-351-2007

ORDERING INFORMATION FOR FAST DELIVERY SEND CASHIER'S CHECK MONEY ORDER OR DIRECT BANK TRANSFER. PERSONAL AND COMPANY CHECKS ALLOW 14 BUSINESS DAYS TO CLEAR. CHARGES FOR C.O.D. ARE $3.00. IN CONTINENTAL U.S.A. INCLUDE 4% SHIPPING ON ALL ORDERS. MINIMUM $4.00. MASTER CARD & VISA ORDERS PLEASE INCLUDE CARD #, EXPIRATION DATE, AND SIGNATURE. WI RESIDENTS PLEASE ADD 5% SALES TAX. HI, AK, FPO, APO, PUERTO RICO AND CANADIAN ORDERS PLEASE ADD MINIMUM 5% SHIPPING AND HANDLING. MINIMUM $5.00. ALL OTHER FOREIGN ORDERS PLEASE ADD MINIMUM 15% SHIPPING. MINIMUM $10.00. ALL GOODS ARE NEW AND INCLUDE FACTORY WARRANTY. DUE TO OUR LOW PRICES ALL SALES ARE FINAL. ALL DEFECTIVE RETURNS MUST HAVE A RETURN AUTHORIZATION NUMBER. PLEASE CALL 414-351-2007 TO OBTAIN AN RA# OR YOUR RETURN WILL **NOT** BE ACCEPTED FOR REPLACEMENT OR REPAIR. PRICES AND AVAILABILITY SUBJECT TO CHANGE WITHOUT NOTICE.

NOTE ON ALL ORDERS OUTSIDE CONTINENTAL U.S.A. WE SHIP ALL ORDERS FIRST CLASS INSURED U.S. MAIL. **IF SHIPPING CHARGES EXCEED THE MINIMUM AMOUNT** YOU WILL BE CHARGED THE ADDITIONAL AMOUNT TO GET YOUR PACKAGE TO YOU QUICKLY AND SAFELY.

MasterCard

NO SURCHARGE ON CREDIT CARDS

VISA

star
micronics·inc

NX-10	**Call**
NL-10C	**Call**
SD-10	**339**
SD-15	**449**
SG-15	**Call**
SR-15	**Call**

PRINTERS

Legend 1080	209
Epson	Call
Juki 5510	389
Toshiba 1340	Call
Legend 808	169
Panasonic 1091	**239**
Powertype	309
Panasonic 1080	215

PRINTER BUFFERS

U-Buff 16K	79.95
U-Buff 64K	99.95

PRINTER INTERFACES

Xetec Super Graphic	69.95
G-Wiz	54.95

MODEMS

Commodore 1660	**49.95**
Westridge 6420	**CALL**
Commodore 1670	159

COMMODORE 64 & 128

NEW NX-10 PRINTER &
XETEC SUPER GRAPHIC INTERFACE

$309

This is a **SHIPPED PRICE** anywhere in continental USA

PANASONIC 1091 &
XETEC SUPER GRAPHIC INTERFACE

$309

This is a **SHIPPED PRICE** anywhere in continental USA

MONITORS

Commodore 1802	Call
Nap Green TTL (for 128)	139
Commodore 1902A	Call
NEC JC1225	139
Gold Star	Call

AMIGA COMPUTER

Call for availability and pricing

AMIGA SOFTWARE

Hacker	29.95
Mindshadow	29.95
Mastertype	27.95
VIP Professional	139.95
Transylvania	27.95
Crimson Crown	27.95
Archon	29.95
Racter	29.95
Analyze	69.95
On-Line	49.95
One on One	29.95
7 Cities	29.95
Skyfox	29.95
Marble Madness	29.95
Return/Atlantis	29.95
Artic Fox	29.95
Fin. Cookbook	34.95
Brataccas	34.95
Adventure Const.	29.95
Deluxe Video	Call
Deluxe Paint	Call
Infocom	Call
Maxicom	39.95
Maxi-Desk	49.95
Maxi-Plan	119.95
Penguin Software	Call
Aegis Software	Call
Exploding Fist	27.95
Deluxe Print	Call
Music Studio	39.95
Halley's Project	29.95
Keyboard Cadet	29.95
Monkey Business	19.95

C-128 COMPUTER
1571 DISK DRIVE
1670 MODEM
1902A RGB MONITOR
1750 RAM EXPANDER
1350 MOUSE
Call for latest price

Commodore 64
1541 Disk Drive
1802 Monitor
Call for Latest Price

COMMODORE 128
SOFTWARE

Superbase 128	69.95
Swiftcalc w/Sidewy	49.95
Wordwriter 128	49.95
Data Manager II	49.95
Fleet System III	54.95
Mach V/128	34.95
King's Quest II	34.95
Home Pak	34.95
Superscr. 128/Spell	69.95
Perfect Writer	49.95
Sylvia Porter-128	49.95
Paperback Writer	32.95
Paperback Filer	32.95
Paperback Planner	32.95
Perfect Filer	49.95
Basic Compiler 128	44.95
Chart-Pak 128	31.95
Cad-Pak 128	44.95
Super C Compiler	59.95
Super Pascal	44.95
Vizistar 128	Call
Viziwrite 128	Call

SUPER TIMEWORKS® SPECIALS*

Data Manager II	**31.95**
Wordwriter/Spell	**31.95**
Swiftcalc/ Sideways	**31.95**
Evelyn Wood	**31.95**
Sideways	**18.95**
Sylvia Porter	**37.95**
Accounts Payable	**37.95**
Accounts Rec.	**37.95**
Sales Analysis	**37.95**
Payroll Management	**37.95**
Inventory Management	**37.95**
Data Manager-128	**42.95**
Wordwriter-128	**42.95**
Swiftcalc-128	**42.95**
Sylvia Porter-128	**42.95**

***SUPER SPECIAL PRICES EFFECTIVE NOW THRU AUGUST 31, 1986**

COMMODORE 64 SOFTWARE

ABACUS 64

Chartpak	31.95
Cad-Pak	31.95
Powerplan	31.95
Super C Compiler	59.95
Super Pascal	44.95
Basic Compiler	31.95
Forth	31.95

ACCESS

Mach V-Cart	21.95
Leader Board	27.95
Tournament Disk	16.95

ACTIVISION

Gamamaker	27.95
Ghostbusters	24.95
Fast Tracks	23.95
Hacker	20.95
Computer Ltl. People	23.95
Alter Ego	34.95
Borrowed Time	20.95

BATTERIES INCLUDED

Cal-Kit-D	34.95
Consultant-D	41.95
Home Pak-D	34.95
Paper Clip/Spellpak	54.95
Home Org. Series-D	16.95
BI-80 Card	**59.95**

BRODERBUND

Bank Street Writer-D	34.95
Music Shop-D	29.95
Print Shop-D	28.95
Kareteka-D	20.95
Champ Loderunner-D	23.95
Prt. Shop Graphics-D	19.95
Print Shop Refill	16.95
Prt. Shop Graph. II or III	19.95
Prt. Shop Companion	27.95
Bank St. Filer	34.95
Bank St. Speller	34.95
Bank St. Mailer	34.95

ELECTRONIC ARTS

Archon-D	19.95
Archon II-D	24.95
Mule-D	19.95
Realm/Imposs.-D	19.95
Murder/Zinderneuf-D	19.95
Music Construction-D	19.95
Pinball Constr.-D	19.95
Skyfox-D	24.95
One on One-D	24.95
Seven Cities of Gold-D	24.95
Mail Ord. Monsters-D	24.95
Racing Destruction-D	24.95
Adventure Constr.-D	29.95
Fin. Cookbook-D	29.95
Bard's Tale	27.95
Europe Ablaze	33.95
Touchdown Football	23.95
Lords of Conquest	27.95
Chessmaster 2000	27.95
Ultimate Wizard	24.95
Super Boulderdash	19.95

EPYX

Fast Load-Cart	24.95
The Eidolon-D	24.95
Winter Games	24.95
Summer Games II-D	24.95
Koronis Rift-D	24.95
Multiplan 64/128	44.95
Program/Tool Kit	29.95
Vorpal Utility	22.95
Movie Monster	24.95
World Karate	19.95
Street Sports	24.95
Super Cycle	24.95

INFOCOM

Deadline-D	29.95
Enchanter-D	24.95
Infidel-D	27.95
Planetfall-D	27.95
Sorcerer-D	27.95
Starcross-D	29.95
Suspended-D	29.95
Witness-D	24.95
Sea Stalker-D	24.95
Zork I, II or III-D	27.95
Wishbringer-D	24.95
Spellbreaker-D	29.95
Ballyhoo	27.95

MICROPROSE

Silent Service-D	23.95
Gunship-D	23.95
Accrojet-D	23.95
F-15 Strike Eagle-D	23.95
Decision in Desert	27.95
Kennedy Approach-D	23.95
Crusade in Europe-D	27.95
Conflict in Vietnam	27.95

MasterCard

MINDSCAPE

Color Me	20.95
Crossword Magic	34.95
Perfect Score	49.95
Halley Project	20.95
Quake Minus One	20.95
Shadowfire	20.95
Lords of Midnight	20.95
Lusher Profile	20.95
Infiltrator	20.95
Bop 'N' Wrestle	20.95
Spell/Destruction	20.95

EST. 1982
ComputAbility

P.O. Box 17882, Milwaukee, WI 53217
ORDER LINES OPEN
Mon-Fri 11 a.m. - 7 p.m. CST • Sat. 12 p.m. - 5 p.m. CST

To Order Call Toll Free

800-558-0003

For Technical Info, Order Inquiries, or for Wisc. Orders

414-351-2007

ORDERING INFORMATION: Please **specify system**. For fast delivery send cashier's check or money order. Personal and company checks allow 14 business days to clear. School P.O.'s welcome. **C.O.D. charges are $3.00.** In Continental U.S.A. include $3.00 for software orders, 4% shipping for hardware, minimum $4.00. Master Card and Visa orders please include card #, expiration date and signature. WI residents please include 5% sales tax. HI, AK, FPO, APO, Puerto Rico and Canadian orders, please add 5% shipping, **minimum $5.00**. All other **foreign orders add 15% shipping, minimum $10.00**. All orders shipped outside the Continental U.S.A. are shipped first class insured U.S. mail. If foreign shipping charges exceed the minimum amount, you will be charged the additional amount to get your package to you quickly and safely. All goods are new and include factory warranty. Due to our low prices all sales are final. **All defective returns must have a return authorization number.** Please call (414) 351-2007 to obtain an R.A.# or your return will not be accepted. Prices and availability subject to change without notice.

SSI

Wizard's Crown	27.95
50 Mission Crush-D	24.95
Cosmic Balance-D	24.95
Germany 1985-D	37.95
Professional Golf-D	24.95
Broadsides-D	24.95
Questron-D	24.95
Computer Qtrback-D	24.95
Field of Fire-D	24.95
Carrier Force-D	37.95
Breakthru Ardennes-D	37.95
Computer Ambush-D	37.95
Kampfgruppe-D	37.95
Oper. Mkt. Garden-D	32.95
Gemstone Warrior-D	21.95
Imperium Galact.-D	24.95
Phantasie-D	24.95
Battalion Comm.-D	24.95
Fighter Command-D	37.95
Norway 1985-D	21.95
Wings of War-D	24.95
Mech Brigade-D	37.95
Battle/Antietnam	32.95
Panzer Grenider	24.95
USAAF	37.95
Phantasie II	27.95
Rings of Zilfin	27.95
Battle Group	39.95
Nam	27.95

TIMEWORKS

Business Systems-D	39.95
Word Writer/Spell-D	34.95
Swiftcalc w/Sideways	34.95
Data Manager II-D	34.95
Sideways-D	20.95
Evelyn Wood-D	34.95
Sylvia Porter-D	39.95

VISA

MISCELLANEOUS 64

Sublogic Football	29.95
Printmaster	24.95
Commando	25.95
Reach/The Stars-D	29.95
Carriers At War-D	34.95
Superbase 64-D	47.95
Strip Poker-D	23.95
Slap Shot Hockey-D	14.95
Sargon III-D	34.95
Ultima II	37.95
Ultima III	37.95
Ultima IV-D	41.95
Fleet System II-D	44.95
Newsroom-D	34.95
Paper Airplane Kit-D	23.95
Vip Terminal-D	34.95
Compuserve Starter Kit	24.95
Flight Simulator II-D	34.95
Loderunner's Resc-D	20.95
Mindwheel-D	27.95
The Works-D	34.95
Perry Mason-D	22.95
Sherlock Holmes-D	23.95
Kobayashi Alternative-D	27.95
Brimstone-D	27.95
The Hobbit-D	23.95
Europe Ablaze-D	33.95
Animation Station-D	49.95
Karate Champ-D	25.95
Essex-D	27.95
Kung Fu/ Exploding Fist-D	20.95
Kung Fu Master-D	25.95
Spy vs. Spy Vol. II-D	23.95
Internat'l Hockey-D	19.95
Fourth Protocol-D	23.95
Blazing Paddles-D	24.95
Super Huey-D	14.95
Spell It-D	34.95
Math Blaster-D	34.95
Hardball	24.95
Dambusters	23.95
PSI Trading Co.	24.95
Law of the West	24.95
Batter Up	24.95
Clip Art I	19.95
Championship Boxing	20.95
Sales Force	49.95
Superman	23.95
Jet	29.95
Alternate Reality	27.95
Sports Library I	19.95
Sticks of Death	20.95
Clip Art Vol. 2	27.95
Fontmaster 2	34.95
Invaders/Lost Tomb	20.95
Mind Pursuit	23.95
Never Ending Story	23.95
Gato	20.95
Art Gallery I	19.95
Star Rank Boxing	20.95
On Field Football	20.95
Star League Baseball	17.95
On-Court Tennis	20.95
Freeze Frame	34.95
The Pawn	29.95
Vizistar XL8	79.95
Hidden Assets	Call
Adv. Music System	54.95
Spitfire 40	23.95

No surcharge for MasterCard or Visa

COMPUTER CENTERS
OF AMERICA

Sizzling Summer Specials
On All Your Computer Needs

IN NEW YORK STATE CALL TOLL FREE **1-800-631-1003**
1-800-221-2760 or 516-349-1020
OR WRITE: COMPUTER CENTERS OF AMERICA, 81 TERMINAL DRIVE, PLAINVIEW, NY 11803

commodore

commodore 64 PACKAGE
INCLUDES:
- Commodore 64 Computer
- Commodore 1541 Disc Drive
- A Color Monitor with Cables

CALL FOR PRICE

14" COLOR RGB MONITOR
THOMSON
A sight for sore eyes.

RGB AND COLOR COMPOSITE
$249.95
SPECIAL INTRODUCTORY PRICE

commodore
1902 MONITOR
CALL FOR PRICE

EPYX
YOUR CHOICE
$24.95
- INCLUDES DELIVERY

Kronis Rift - Lucas Games
Eidolon - Lucas Games
Ballblazer - Lucas Games
Rescue Fractalus - Lucas Games
Fastload
Wintergames
Hot Wheels
Temple of Asphai Trilogy
Jet Combat Simulator
GI Joe
Summer Games I or II
Barbie
Baseball

We Carry **ALL** Commodore Software

Fleet System II
$59.95
Fleet System III
$64.95

- INCLUDES DELIVERY

commodore
1571 DISC DRIVE
$249.95
- Including: Shipping, Handling and Insurance—No Extra Charges

- INCLUDES DELIVERY

commodore
128
PERSONAL COMPUTER
$259.95
- Including: Shipping, Handling and Insurance—No Extra Charges

SUMMER SPECIAL PACKAGE

- Commodore 128
- Commodore 1571
- RGB/Composite
- Color Monitor

$729.95
- INCLUDES DELIVERY

SP-1000
- Built-in Commodore Interface
- 2-Year Warranty
- Near Letter Quality Mode

$189.95
SEIKOSHA
LIMITED TIME ONLY
SPECIAL INTRODUCTORY PRICE

PRINTER SPECIALS
FROM CCA
STAR POWER TYPE
- Letter Quality • 18 CPS • 13" Carriage with Comm. Interface.

BEST BUY SPECIAL **$259.95**

GEMINI STAR 10X
WOW! $139

Goldstar
13" COLOR COMPOSITE MONITOR
- Cables included • 1 Yr. Mfr. Warranty

$124.95

Paperback Writer 128
Paperback Filer 128
Paperback Planner 128
YOUR CHOICE
$29.95
for the Commodore 128

INTERFACES

Teleys Turbopoint GT Prints Enhanced Graphics	$59.95
Cardco G +	Call for Price
Microworld	Call for Price
PPI	$44.95
Xelec - Super Graphics Sr.	$69.95
Xelec - Super Graphics Jr.	$49.95

Check, Money Order, MC or VISA accepted. No additional charge for MasterCard and Visa. Call for shipping and handling information / NYS residents add applicable sales tax / Prices and availability are subject to change without notice / All factory fresh merchandise with manufacturer's warranty. Dealers Welcome. Call for recent price reductions and new rebate information. Plus shipping and handling. No returns without return authorization number.
*IN CONTINENTAL USA ONLY. APO PLUS FPO EXTRA.

COMPUTER
COMPUTER CENTERS
OF AMERICA
81 TERMINAL DRIVE
PLAINVIEW, NY 11803

IN NEW YORK STATE CALL TOLL FREE
1-800-221-2760 or 516-349-1020
OR WRITE: COMPUTER CENTERS OF AMERICA
81 TERMINAL DRIVE, PLAINVIEW, NY 11803
1-800-631-1003
1-800-548-0009

A Printer For All Reasons

Search For The Best High Quality Graphic Printer

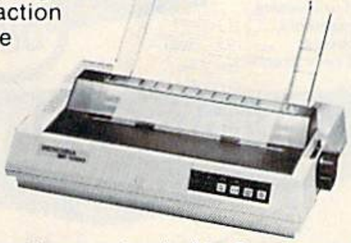
The Results Are In We ran many printers through our battery of tests and this one came out first in its class. Our SP-1000, built by Seiko is a 100 characters per second, (12 horizontal by 9 vertical matrix), full bi-directional, logic seeking, true descender printer. The character matrix in NLQ (Near Letter Quality) mode is a very dense 24 (horizontal) by 18 (vertical).

Features That Won't Quit With the SP-1000 your computer can now print 40, 48, 68, 80, 96, or 136 characters per line. You can print in scores of style variations. You not only have standard Pica, Elite, Condensed and Italics, but also true Superscripts and Subscripts. Use **bold**, or *italics* to make the words stand out. Or, if you wish to be even more emphatic, underline the words. You can combine many modes and styles to make the variation almost endless.

Forms? Yes! Your Letterhead? Of Course! The tractors are adjustable from 4 to 10 inches. You can also use single sheets, plain typing paper, your letterhead, short memo forms, labels, whatever you choose. Any size to 10" in width. It will even load your paper automatically. Multiple copies? Absolutely! Use forms up to 3 thick. Spread sheets with many columns? Just go to condensed mode printing and print a full 136 columns wide all on a standard 8½" wide page. Forget expensive wide-carriage printers and having to change to wide carriage paper.

An Extra Long Life (2.5 million character) ribbon cartridge is only $11.00. Order #2001. You need absolutely nothing else to start printing—just add paper (single sheet or fanfold tractor).

No Risk Offer We give you a 2-week satisfaction guarantee. If you are not completely satisfied for any reason we will promptly refund your purchase.



The warranty has now been extended to 2 years and service centers are located nationwide for your convenience.

The Bottom Line:

Commodore C-64 & C-128, Order #2200. graphics interface & cable built in. $199.95

IBM-PC and compatibles, Order #2100, $219.95 plus 8' shielded cable #1103, $16.95

Apple IIc or Macintosh, Order #2300, $219.95 with cable, specify computer

Standard Parallel with 36 pin Centronics connector, Order #2400, $219.95 no cable

Standard Serial with RS-232 (DB-25) Connector, Order #2500, $219.95 no cable

Be sure to specify the order # for the correct version printer designed for your computer.

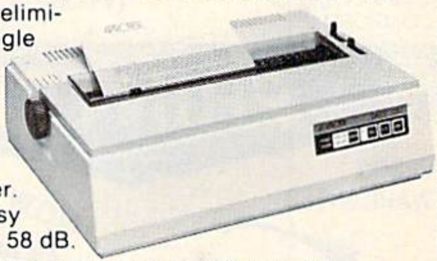
Interfaces and cables for other computers. Call 805/987-2454 for details.

Shipping in cont. US is $10.00. UPS Blue is $22.00.

Letter Perfect

Now! Full Feature, 20 CPS, Letter Quality Printer only $319.95

For those who need a Daisy Wheel Printer, our Daisy 1120 has it all. To start with, it has a front control panel with indicators for Pitch Selection which allows for 10, 12 or 15 pitch or Proportional Space printwheels. There is a Select (Online) button with indicator and a Line Feed button. You can also set Top-of-Form or Form Feed with the touch of a button. Other indicators include Power and Alarm. The built in 2K buffer allows a page or two of concurrent printing and use of your computer for the next job. To really take advantage of your printer's optional features, the automatic Cut Sheet Feeder eliminates tiresome single page handling and the adjust able Tractor Feed option handles all continuous form paper. Best of all the Daisy 1120 is quiet: only 58 dB.



Total Compatibility The Daisy 1120 uses 96 character Diablo® compatible printwheels. At 15 pitch you can print 165 columns—a must for spreadsheets.

The Daisy 1120 uses the Diablo Hytype II® standard ribbon cartridges, also universally available.

Not only is the hardware completely compatible, the control codes recognized by the Daisy 1120 are Diablo 630® compatible (industry standard). You can take advantage of all the great features of your word processing package and automatically use superscripts, subscripts, automatic underlining, boldface and doublestrike.

The printer has a set of rear switches which allow the use of standard ASCII as well as foreign character printwheels. Page length can be set to 8, 11, 12, or 15". The Daisy 1120 can also be switched to add automatic line feed.

Try the Daisy 1120 for 2 weeks. If you are not satisfied we will issue a prompt refund. 1-year parts and labor warranty is included.

The Bottom Line Aprotek Daisy 1120 (Order #1120) $319.95 w/standard Centronics parallel interface, 2K buffer, ribbon and printwheel.

Options: *Compare our prices!*
Auto Cut Sheet Feeder (#1110) $185. Shipping $7.
Bidirectional Tractor Feed (#1112) $75. Shipping $5.
Interfaces for most computers are available—call.
Shipping in cont. US is $11. UPS Blue is $24.

ORDERING INFORMATION California residents add 6% tax. All prices are cash prices — VISA and MC add 3% to total. We ship the next business day on money orders, cashier's checks, and charge cards. A 14-day clearing period is required for checks. Prices subject to change—CALL. Dealer inquiries invited.

For information call **805/987-2454**
TO ORDER CALL TOLL FREE
1 (800) 962-5800 - USA (8-8 PST)
1 (800) 962-3800 - Calif.

Or send order to:

APROTEK DEPT. CG
1071-A Avenida Acaso, Camarillo, CA 93010

COMMODORE ★ ATTARI ★ IBM ★ APPLE

MONITORS

FULL WARRANTY

COLOR
COMPOSITE

$119^00

(RGB's Available)

MODEMS

300
BAUD

$28^00

Sale!

1200
BAUD

$98^00

PRINTER

EPSON
WARRANTED

NOW

RETAIL
$200^00

$88^00

FREE TRIAL PERIOD

NLQ PRINTER

EPSON
WARRANTED

NEAR LETTER QUALITY

NOW

RETAIL $299.00

$139^00

COMREX CR20-A

DISK DRIVES

1541
COMMODORE

$149^00

PLUS/4

COMMODORE
COMPUTER

INCLUDES BUILT-IN SOFTWARE

for word processing, file management, spreadsheets and 128 color graphics!

FULL WARRANTY

$68^00

64 POWER SUPPLY

COMMODORE

$39^00

ELECTRIC TYPEWRITER

FULL WARRANTY

IBM
SELECTRA II

NOW

RETAIL $1200.00

$499^00

FREE TRIAL PERIOD

PRO-TECH-TRONICS

6870 Shingle Creek Parkway #103 • Minneapolis, MN 55430 • (612) 560-6603

*IN STOCK ITEM

CALL TODAY

—NEXT-DAY DELIVERY*—

SCHOOL P.O.'s Accepted!

1-800-345-5080

First, Fast...
and Still the Best!

We're the first company to offer fast, expert Commodore service anywhere in the USA. And we're still the best!

For one low price, we repair all problems on most types of Commodore equipment. All regular repairs carry a 30-day warranty, with a full-year warranty available for only $30 more. For preventive maintenance, we also offer a 1-Year service Contract at a savings of $20.00. Check our low prices!

	Repair with 30-day Warranty	**Repair with 1-Year Warranty**	**1-Year Service Contract**
C-64 or C-128 Computer	$59	$89	$69
1541 or 1571 Drive	65	95	75
1702, 1802 or 1902 Monitor	75	105	85
MPS-801, 802, 1525 or 1526	59	89	69
1541 or 1571 alignment (only)	Just $29.95		

And as an extra benefit — our repair customers are eligible for big discounts on software and hardware purchases.

FREE PERMANENT FIX

A $69.95 value — includes alignment and modification to stay in alignment. FREE for a limited time with any 1541 repair!

We also offer the best rates for Amiga repairs.

For fast, expert service . . .
Just call our toll free number today!

1-800-624-6794

(For your convenience, have your equipment serial number and credit number ready. Checks and money orders also accepted). Add $7.50 for shipping — includes two-day air service anywhere in the Continental USA. For APO-FPO and P.O. Box addresses, add $15.00 for shipping (excluding air freight).

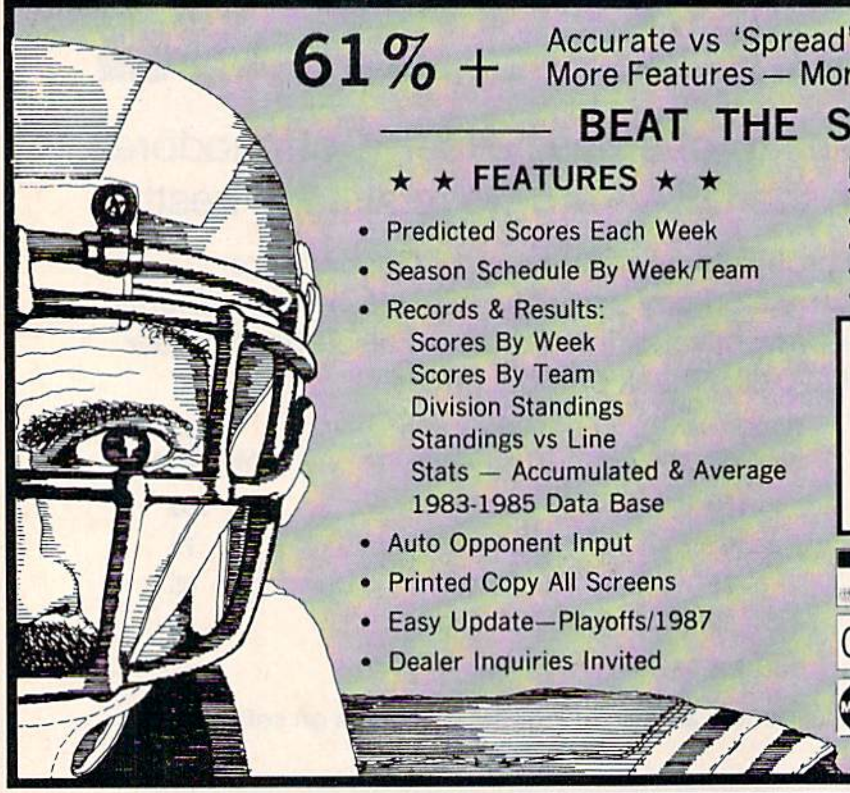
TRIAD COMPUTERS

3402-E W. Wendover Ave., Greensboro, NC 27407
1-800-624-6794 or (919) 299-0391

PIK'EM 86

★ ★ ★ ★

A Complete Pro Football Prediction Program For The 1986 NFL SEASON



61% + Accurate vs 'Spread' Since 1981
More Features — More Information In 1986 To . . . .

BEAT THE SPREAD

★ ★ FEATURES ★ ★

- Predicted Scores Each Week
- Season Schedule By Week/Team
- Records & Results:
  - Scores By Week
  - Scores By Team
  - Division Standings
  - Standings vs Line
  - Stats — Accumulated & Average
  - 1983-1985 Data Base
- Auto Opponent Input
- Printed Copy All Screens
- Easy Update—Playoffs/1987
- Dealer Inquiries Invited

54.95 INCLUDES DISK, DOCUMENTATION SHIPPING & HANDLING

- Apple II — IIc — IIe
- Commodore 64 — 128
- IBM PC, Tandy & Compatibles
- TRS-80 MIII/IV

Stats Needed To Run Program Available In Local Newspapers
Or
We Will Furnish Stats By Mail Or Modem All 20 Weeks — Season Price . . . 40.00

Program Comes Updated Thru Current Week Of Season . . . No Extra Charge

ORDERS SHIPPED IN 2 DAYS
PHONE LINES OPEN 24 HRS.

VISA · C.O.D. · MasterCard

TOLL FREE — 800-722-2277
TEXAS COLL. — 214-586-8212

MARATHON SOFTWARE DEPT. G
P. O. BOX 1349
JACKSONVILLE, TEXAS 75766
TOLL FREE & COLLECT FOR ORDERS ONLY

THE LOWEST PRICES · THE BEST SERVICE

ELECTRONIC ONE*

PHONE LINES OPEN 10-6 E.S.T. M-F

CALL (614) 864-9994 • P.O. Box 13428 • COLUMBUS, OHIO 43213

COMMODORE HARDWARE

C128 COMPUTER	249.97
C64 COMPUTER	139.97
1541 DISK DRIVE	179.97
1571 DISK DRIVE	229.97
1702 MONITOR	179.97
1802 MONITOR	179.97
1902A R.G.B. MONITOR	269.97
MPS 1000 PRINTER	239.97
1350 MOUSE	39.97

PRINTERS

SG10-STAR	219.97
SG10C-STAR	229.97
STAR NX 10	239.97
PANASONIC 1080	199.97
PANASONIC 1091	229.97
EPSON LX 80	219.97
SEIKOSHA	179.97
COMREX	69.97

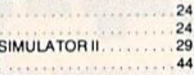
MISC. HARDWARE

G WIZ INTERFACE	46.97
CARDCO-G INTERFACE	37.97
TYMAC INTERFACE	49.97
PPI INTERFACE	32.97
XETEC JR.	39.97
XETEC SR. (8k)	59.97
TOTAL COMM. MODEM	29.97
COMM. 1200 BAND MODEM	149.97
MESSENGER MODEM	32.97

MONITORS

14'' THOMPSON COLOR	139.97
12'' NEC 1225 COLOR	129.97
13'' SAKATA COLOR	139.97

commodore



SOFTWARE

KUNG FU EXPLODING FIST	14.97
KUNG FU STICKS OF DEATH	14.97
KARATE CHAMP	19.97
KUNG FU MASTER	19.97
KARATEKA	19.97
HARDBALL	18.97
PSI TRADING CO.	18.97
DAM BUSTERS	18.97
LAW OF THE WEST	18.97
FIGHT NIGHT	18.97
COPY II	24.97
JET	24.97
FLIGHT SIMULATOR II	29.97
S'MORE	44.97
FAST LOAD	22.97
MACH 5	22.97
MACH 128	28.97
SUPER PASCAL	44.97
HOME PAC	29.97
HOME ACCOUNTANT	19.97
SYLVIA PORTER	54.97
PRINT SHOP	27.97
NEWS ROOM	32.97
PRINT SHOP COMPANION	22.97
PRINT SHOP GRAPH LIB.	14.97
WORD WRITER 128	44.97
MULTI PLAN 128	44.97

SOFTWARE

SARGON III	29.97
MICRO LEAGUE BASEBALL	24.97
HACKER	16.97
SILENT SERVICE	22.97
F-15	19.97
PAPER CLIP	34.97
PAPER CLIP SPELL PACK	44.97
LEADER BOARD	23.97
LITTLE COMP. PEOPLE	19.97
SUPER BOWL SUNDAY	19.97
MUSIC SHOP	29.97
ONE ON ONE	24.97
SKY FOX	24.97
TOUCHDOWN FOOTBALL	19.97
GATO	19.97
CHAMP BOXING	15.97
ALTER EGO	26.97
BARD'S TALE	24.97

DISKS

SONY S/S D/D	7.97
BASF S/S D/D	7.97
PRECISION D/S D/D/	8.97
BONUS D/S D/D/	8.97
CENTECH COVER S/S D/D	8.97
DISK NOTCHER	2.97
FLIP N FILE (50)	6.97

JOYSTICKS

THE BOSS	11.97
THE BAT	16.97
3 WAY	19.97
KRAFT	7.97
SPECTRO VIDEO 1	4.97
SPECTRO VIDEO 2	7.97

SPECIALS

BREAK DANCE	7.99
SIMONS BASIC	7.99
ALF COLOR CAVES	3.99
TURTLE TOYLAND	2.99
STORY MACHINE	3.99
COSMIC LIFE	3.99
JUKE BOX	3.99
DELTA DRAWING	3.99
FACE MAKER	3.99
UP FOR GRABS	3.99
PITFALL	3.99
CONGO BONGO	3.99
SNOOPER TROOPS NO. 1	3.99
SNOOPER TROOPS NO. 2	3.99
SEA HORSE	4.99
AEGEAN VOYAGE	3.99
DUCKS AHOY	4.99
WEBSTER WORD GAME	4.99
JUICE (D)	3.99
MISSING LINKS (D)	2.99
TURTLE TOYLAND JR.	1.99
SNAKE MAN	1.99
JAWBREAKER II	3.99
DIG DUG	4.99
POLE POSITION	6.99
GRID RUNNER	1.99
GRID RUNNER II	1.99
Q-BERT	4.99
BEAM RUNNER	4.99
JUMP MAN JR.	4.99

ALL QUALITIES ARE LIMITED
ALL ARE DISK OR CART

HOW TO ORDER: CASHIER CHECK, MONEY ORDER, MASTERCARD* OR VISA* (ADD 4% FOR CHARGE CARDS) . . . NO PERSONAL CHECKS . . . NO C.O.D.'s . . . SHIPPED U.P.S. . . . ALL PRICES SUBJECT TO CHANGE WITHOUT NOTICE.
SHIPPING: ADD $3.00 ON ALL ORDERS UNDER $100.00 . . . ADD $5.00 ON ALL ORDERS OVER $100.00. ACTUAL FREIGHT CHARGED ON MULTIPLE ORDERS.
INTERNATIONAL: ACTUAL FREIGHT CHARGED ON ALL ORDERS OUTSIDE THE CONTINENTAL UNITED STATES INCLUDING A.P.O.
POLICIES: NO RETURNS WITHOUT A RETURN AUTHORIZATION . . . NO RETURNS UNLESS DEFECTIVE. ALL DEFECTIVES WILL BE EXCHANGED . . . NO EXCEPTIONS.

CALL OR WRITE FOR FREE CATALOG

CALL ELECTRONIC ONE (614) 864-9994

Sensational Prices!
. . . On Our Most Popular Items!

from micro fat® . . .

THE 69¢ DISKETTE!

Are you paying too much for diskettes? Try our first quality, prime, 5¼" diskettes (no rejects, no seconds) at these fantastic sale prices and save, save, SAVE! Disks are packaged in boxes of 50; each box contains 5 shrink-wrapped 10-packs that include diskettes in sleeves, labels, and write-protect tabs.

Each diskette is certified to be 100% error free and comes with a lifetime warranty (if you have a problem, we'll replace the diskette). All diskettes include hub reinforcement rings and write-protect notch.

All diskettes are double density and work in either single or double density drives.

SS, DD Diskettes, Box of 50 **32391**	**$34.50**-69¢ ea.!
DS, DD Diskettes, Box of 50 **32403**	**$44.50**-89¢ ea.!

POWER and PROTECTION FOR YOUR C-64!

POW'R PAK 64

Pow'r Pak is a replacement power supply (1.5 amp) for the Commodore 64 . . . but that's not all! Pow'r Pak also supplies two additional surge protected outlets (120V) for monitor, disk drive, or other peripherals. On/off switch. Fuse protection. Sturdy all-metal casing is ventilated for heat dissipation. Full 1 year warranty.

34910 **$49.95**

CARTRIDGE EXPANDER

Plus $22.95
FAST LOAD
OFFER!

Stop wearing out your computer by endless cartridge swapping! The Navarone cartridge expander features 3 cartridge slots. Reset the computer independently of the power switch. Cartridge slots are vertical for easy access — no blind fumbling behind the computer.

33227 3-slot Cartridge Expander **$22.95**

The cartridge expander is a great companion for the Epyx Fast Load cartridge — you can keep it permanently installed plus have two sides free for other cartridges!

34216 Fast Load Cartridge (Sug. Retail $39.95) **$24.95**

Fast Load Only $22.95
with purchase of cartridge expander!

$ LOWEST PRICES IN U.S.A.! $

star MICRONICS·INC BMC EPSON AXIOM CARDCO INDUS

We can offer you some of the lowest prices in the country on the most popular printers, monitors and interfaces. Our normal prices are already low, but to make sure you get the best deal you can, we will also meet most competitive prices in this publication when placed on an equal basis *(Remember—we don't charge for use of your credit card, impose excessive shipping fees, or use any other hidden extras to boost the price you pay. Due to the rapid change in prices in the computer industry, we can only meet prices at the time you place your order; we cannot adjust prices on items ordered or shipped on an earlier date.)* Another plus for charge card customers — your charge card is billed at time of shipment only for the items shipped — no early billing, no long wait for the merchandise you already paid for.

COMMODORE	
C-128 Computer	$CALL
1571 Disk Drive	$CALL
1902 Monitor	$CALL
1670 Modem	$CALL
EPSON	
FX-85	$CALL
FX-286	$CALL

STAR MICRONICS	
NX-10	$CALL
SG-10C	$CALL
CARDCO	
G-Wiz Interface	$CALL
S'MORE	$CALL
Super-G	$CALL

FAMOUS NAME SOFTWARE
Epyx
Broderbund
Infocom
Sierra
Timeworks
Random House
Activision, and many more!

★ THE BEST PRICES ★
★ THE BEST SERVICE ★
WHY SHOP ANYWHERE ELSE?

COMMODORE-READY PRINTER **ONLY $\$79^{95}$!**

80-column dot-matrix printer includes direct plug-in cable (no other interface needed), 50 cps, tractor feed, prints upper/lower case, numerals, symbols and graphics. 1 year warranty by Epson.
Sug. Retail $149.95
40733 **$79.95**
Supply limited! Order now!

WARRANTY BY EPSON

80-COLUMNS ON YOUR COMPOSITE MONITOR!
Switch Selectable

Our new cable connects your C-128 to any color or monochrome monitor and lets you switch-select 40-column color (color monitor only), or 40-column monochrome, or 80-column monochrome. A great way to use 80-columns on the C-128 without the expense of an RGB monitor! No other cable required.

40771 .... **$24.95**

OUR BEST MONITOR VALUE EVER!

$149.95

The black matrix picture tube on this 14" composite monitor provides impressive color . . rich blacks, vivid colors and brilliant whites. Includes built-in audio speaker; controls for volume, brightness, contrast, color, tint and sharpness. One year warranty on parts and labor, 2 years on picture tube. From Samsung. Supply Limited! Order Today!

40728 .... **$149.95**

Monitor Cable (required). Works with C64, C128 (in composite mode), TI 99/4A and many others.

37424 .... **$7.95**

DUST COVER and "EVERYTHING BOOK" SPECIAL OFFER

Get to know us by ordering this great dust cover for your C-64 or C-128 and our catalog, "The Everything Book for the C-64 and C-128 Home Computers," for $2.95 (no extra shipping and handling charges). Cover is antistatic, translucent 8-gauge vinyl sewn to our exacting standards with reinforced seams. Discover the savings and easy shipping available from TENEX Computer Express!

$2.95

31627 C-64 Dust Cover and Catalog (G1S)
38464 C-128 Dust Cover and Catalog (G1S)

The Right Interface For All Your Printing Needs!!

PPI with graphics

". . . a sound investment for your Commodore." RUN, *Dec. '85*

This high-performance graphics parallel printer interface from DSI for C-64 and VIC-20 emulates a Commodore printer. Comes with cables and user's manual.

33565 .... **$39.95**

G-Wiz **Interface**

Built-in buffer provides super high-speed printing for parallel printers. Prints all Commodore characters. Cables and connectors included. From Cardco. Lifetime warranty.

34484 .... **SCALL**

SUPER G

This upgrade to the G-Wiz offers more speed, large buffer, accessible dip switches, and an 18" ribbon cable. From Cardco. Lifetime guaranty.

40502 .... **SCALL**

From Your Friends At
TENEX Computer Express

We gladly accept mail orders!

P.O. Box 6578
South Bend, IN 46660

Questions? Call
219/259-7051

Ad G1S

SHIPPING CHARGES

ORDER AMOUNT	CHARGE
less than $20.00	$3.75
$20.00–$39.99	4.75
$40.00–$74.99	5.75
$75.00–$149.99	6.75
$150.00–$299.99	7.75
$300 & up	8.75

MasterCard American Express Card VISA

NO EXTRA FEE FOR CHARGES

WE VERIFY CHARGE CARD ADDRESSES.

ORDER TOLL FREE
1-800-348-2778

Pigskin Predictions!

Tired of wrestling with Sunday point spreads? Let your Commodore 64/128 do it for you! Pigskin Predictions, the best-selling NFL handicapper, takes the hassle out of rating National Football League games. Forget about obscure, meaningless statistics. Just spend a few minutes typing in each week's scores and let our point spread software go to work. Here's what Pigskin Predictions has to offer:

- Predicts point spreads for all games--for the current week and the remainder of the season.
- Calculates projected won-lost records for all weeks.
- Menu-driven selection of schedules, ratings, division races, predictions or results by team or week. Seven different reports to screen or printer!
- Maintains home field advantage and power ratings for all NFL teams.
- 1986 Schedule data file included free. Yearly updates available.

Pigskin Predictions is only $39.95 on disk. Get your copy now and be ready for the season!

The Handicapper

Use your **Commodore 64/128** to improve your performance at the track! Programs for **Thoroughbred, Harness** and **Greyhound** racing rank the horses or dogs in each race quickly and easily. All the information is readily available from the *Racing Form*, harness or dog track program.

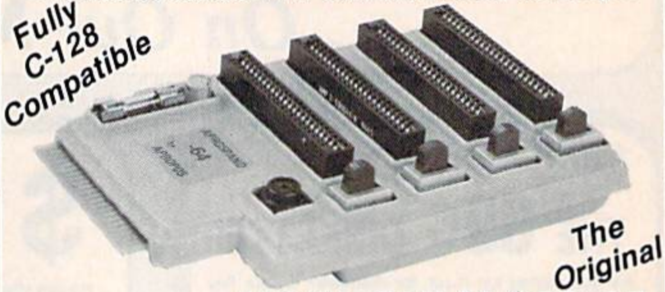
Thoroughbred factors include speed, distance, past performance, weight, class, jockey's record, beaten favorite and post position. **Harness factors** include speed, post position, driver's record, breaking tendencies, class, parked-out signs and beaten favorite. **Greyhound factors** include speed, past performance, maneuvering ability, favorite box, class, kennel record, beaten favorite and breaking ability.

Complete instructions and wagering guide included. **Thoroughbred, Harness** or **Greyhound Handicappers**, $39.95 each on tape or disk. Any two for $59.95 or all three for $79.95.

Federal Hill Software
8134 Scotts Level Rd.
Baltimore, MD 21208

Toll Free Orders 800-628-2828 Ext. 850
For Information 301-521-4886

APROSPAND-64™ Gives your Commodore 64 or 128 full expandability! This superbly designed expansion module plugs into the expansion port & gives you 4 switchable (singly or in any combination) expansion connectors - plus fuse protection - plus a reset button! Before you buy an expander, be sure that it has a fuse to protect your computer and that you can activate your cartridges in **ANY** combination allowed by the cartridges.



NOW ONLY $29.95

Commodore Interfaces and Cables

Cardprint G-WIZ Printer Interface #1108	$46.95
Cardprint B (without Graphics) #1105	$35.95
Amiga Printer Cable (6 ft) #3040-6MM	$17.95
Amiga Printer Cable (10 ft) #3040-10MM	$21.95
Commodore 6 Pin Serial Cable (5 ft) #3006-5MM	$ 9.95
Commodore 6 Pin Serial Cable (8 ft) #3006-8MM	$12.95
Add Shipping Per Item: $3.00 Cont. U.S.	**$6.00 CAN, PR, HI, AK, APO, UPS Blue**
APROTEK Daisy 1120, 20 CPS Daisy Wheel	$319.95
Elite 5CD, 10 CPS Daisy Wheel Printer Commodore Direct Connect + Parallel	$184.95
Add Shipping Per Item: $10.00 Cont. U.S.	**$22.00 CAN, PR, HI, AK, APO, UPS Blue**

All Products have 2 Week Satisfaction or Money Back Guarantee

TECHNICAL INFORMATION (805) 987-2454
CALL TOLL FREE TO ORDER: (800) 962-5800 US
or (800) 962-3800 CA

CA Res. Add 6% Tax. Listed are cash prices. VS & MC Add 3%

APROTEK 1071-A Avenida Acaso, Camarillo, CA 93010

NEW VERSION 3.0 FOR C64 & C128 IN 128 MODE.

THE MIRROR

DISK COPIER

$24.95

NO FINER OR MORE ADVANCED ARCHIVAL COPIER AVAILABLE AT ANY PRICE.
EASY TO USE. DOES NOT CAUSE DRIVE HEAD TO KNOCK.
COPIES UP TO 41 TRACKS.
PERIODIC UPDATE POLICY.
AUTOMATICALLY MAKES BACK-UP COPIES FROM VIRTUALLY ALL PROTECTED SOFTWARE.
NIBBLES, HALF TRACKS, COPIES EXTRA SECTORS AND EXTRA TRACKS.
REPRODUCES ALL DISK ERRORS AUTOMATICALLY.
FAST, COPIES FULL DISK IN AS LITTLE AS 4-7 MINS. EVEN COPIES ITSELF.

WE COPY MORE!
MASTERCARD, VISA, M.O. OR CHECK OK
+ $3 SHIPPING & HANDLING
C.O.D. OR FOREIGN ORDERS ADD $2
CALIF. ORDERS ADD 6% SALES TAX
— WRITE OR CALL —

Compumed
(408) 758-2436
P.O. BOX 6939
SALINAS, CA 93912
FOR COMMODORE 64 AND 1541 DRIVE
OR COMMODORE 128 AND 1571 DRIVE

Software Discounters of America

S.D. of A.

For Orders Only—1-800-225-7638
PA Orders—1-800-223-7784
Customer Service 412-361-5291

Open Saturday

- Free shipping on orders over $100 in continental USA
- No surcharge for VISA/MasterCard
- Your card is not charged until we ship

ABACUS
Basic 128
Chart Pak 128 CALL
Power Plan 64 FOR
Super C 128 PRICES
Super Pascal 128
ACCESS
Beach Head (D) $21
Beach Head 2 (D) $24
Leader Board Golf (D) $25
Leader Board Tournament Disk $14
Mach 5 (R) $23
Mach 128 (R) $33
Raid Over Moscow (D) $24
ACTIVISION
Alter Ego (Male or Female) $33
Borrowed Time (D) $19
Comp. Fireworks Celebration Kit (D) $23
Garry Kitchen's Gamemaker (D) $25
Great American Cross-Country Road Race (D) $19
Hacker (D) $19
Little Computer People (D) $23
Mindshadow (D) $19
Murder on the Mississippi (D) $23
Space Shuttle (D) $19
ACCOLADE
Aces of Aces (D) $19
Dambusters (D) $19
Fight Night (D) $19
Hard Ball (D) $19
Law of the West (D) $19
PSI-5 Trading Co. (D) $19
AMERICAN EDUCATIONAL
Biology (D) $14
French (D) $14
Grammar (D) $14
Science: Grades 3/4(D) $14
Science: Grades 5/6(D) $14
Science: Grades 7/8(D) $14
Spanish (D) $14
U.S. Geography (D) $14
World Geography (D) $14
World History (D) $14
ARTWORX
Beach Blanket Volleyball (D) $12
Bridge 4.0 (D) $16
Cycle Night (D) $12
Equestrian Show Jumper (D) $12
Hole in One + Six (D) $14
Int'l Hockey (D) $16
Strip Poker (D) $21
Data Disk #1 female $16
Data Disk #2 male $16
Data Disk #3 female $16
ARTWORX PX
Baker St. Detective (D) $7
Hole In One Golf (D) $7
Hotel Alien (D) $7
Jumpin' Jimmy (D) $7
Pro Boxing (D) $7
AVALON HILL
Gulf Strike (D) $19
Jupiter Mission 1999(D) $23
Parthian Kings (D) $16
Ripper (D) $16
Super Bowl Sunday (D) $21
SBS 1984 Team Disk $14
SBS Champs Disk $14
Spitfire '40 (D) $23
Title Bout (D) $19
Tournament Golf (D) $19

BATTERIES INCLUDED
Consultant (64 or 128) $39
Home Pak (D) $33
Paperclip w/Spell 64 or 128 $49
BERKELEY SOFTWORKS
Geos (D) $39
BRODERBUND
Bank St. Filer (D) $33
Bank St. Mailer (D) $33
Bank St. Writer (D) $33
Bank St. Speller (D) $33
Karateka (D) $19
Music Shop (D) $29
Print Shop (D) $26
P.S. Companion (D) $23
P.S. Graphics Library #1, #2, or #3 $16 Ea.
CARDCO
Calc Now (D) $14
File Now (D) $14
Freeze Frame (R) $33
Graph Now (D) $14
G-wiz Printer Int. $47
Hidden Assets (R) $49
Mail Now (D) $14
S'more (R) $44
Super G Pr. Int. $49
Write Now (R) $19
CBS
Argos Expedition (D) $9
Big Bird's Funhouse(R) $9
Big Bird Spc. Del. (R) $9
Body in Focus (D) $23
Dream House (D) $9
Ernie's Big Splash (D) $9
Ernie's Magic Shapes (R) $9
Grover's Animal Adventures (D) $9
Mastering the SAT (D) $44
Math Mileage (D) $9
Movie Musical Madness (D) $9
Railroad Works (D) $9
Rich Scarry's Electronic Word Book (D) $12
Sesame St. Pals Around Town (D) $9
Success w/Algebra Call
Success w/Math Call
Timebound (D) $9
Weather Tamers (D) $9
DATA EAST
Karate Champ (D) $23
Kung Fu Master (D) $23
DATASOFT
Alternate Reality (D) $25
The Goonies (D) $19
Never Ending Story (D) $19
Zorro (D) $19
DAVIDSON
Math Blaster (D) $33
Speed Reader 2 (D) $43
Spell It (D) $33
Word Attack (D) $33
DIGITAL SOLUTIONS
Paperback Writer 64 Call
Paperback Writer 128 Call
ELECTRONIC ARTS
Adv. Const. Set (D)
Archon 2: Adept (D)
Bard's Tale (D)
Carriers at War (D)
Chessmaster 2000 (D)
Europe Ablaze (D)
Heart of Africa (D)
Lords of Conquest (D)
Mail Order Monsters (D)
Movie Maker (D)
Music Const. Set (D)
One-on-One (D)
Pinball Const. Set (D)
Racing Dest. Set (D)
Seven Cities of Gold (D)
Skyfox (D)
Super Boulder Dash (D)
Touchdown Football (D)
Prices too low to advertise!! ***Call***
EPYX
Barbie (D) $9
Breakdance (D) $9
Fast Load (R) $23
Impossible Mission (D) $9
Koronis Rift (D) $23
Movie Monster (D) $25
Multiplan 64 or 128 $39
Summer Games 2 (D) $25
Temple of Apshai Trilogy (D) $25
The Eidolon (D) $23
Vorpal Utility Kit (D) $23
Winter Games (D) $25
World Championship Karate (D) $19
World's Greatest Baseball-Improved $23
World's Greatest Football (D) $23
FIREBIRD
Adv. Music System (D) $49
Colossus Chess 4 (D) $23
Elite (D) $19
Music System (D) $25
The Pawn (D) Call
FIRST STAR
Spy vs. Spy 2 (D) $19
FISHER PRICE
Alpha Build (R) $9
Dance Fantasy (R) $9
Hop Along Counting (R) $9
Linking Logic (R) $9
Memory Manor (R) $9
Number Tumbler (R) $9
Sea Speller (R) $9
GAMESTAR
Champ. Basketball (D) $19
On-Court Tennis (D) $19
On-Field Football (D) $19
Star-League Baseball (D) $19
Star Rank Boxing (D) $19
HAYDEN
Sargon 3 (D) $33
HES
Millionaire (D) $16
Omniwriter w/Spell (D) $23
Project Space Station (D) $16
HI-TECH EXPRESSIONS
Card Ware (D) $9
Heart Ware (D) $9
Party Ware (D) $14
INFOCOM
Ballyhoo (D) $25
Cut Throats (D) $23
Deadline (D) $29
Enchanter (D) $23
Hitchhiker's Guide to the Galaxy (D) $23
Infidel (D) $25
Invisiclues $5 Ea.
Planetfall (D) $23
Sorcerer (D) $25
Spellbreaker (D) $29
Suspect (D) $25
Trinity 128 $25
Wishbringer (D) $23
Witness (D) $25
Zork 1 (D) $23
Zork 2 or 3 (D) $25
KOALA
Muppet Learning Keys (D) $29.95
LEARNING COMPANY
All Titles Available Call
MASTERTRONIC
Action Biker (D) $7
Ant Attack (D) $7
BMX Racer (D) $7
Captive (D) $7
Finders Keepers (D) $7
Infinity Machine (R) $19
Kikstart (D) $7
5-A-Side Soccer (D) $7
Last V-8 (D) $7
Paul McCartney's Broad Street (D) $7
The Slugger (D) $7
Vegas Jackpot (D) $7
MICROLEAGUE
Baseball (D) $25
General Manager (D) $25
1985 Team Data Disk $14
MICROPROSE
Acrojet (D) $23
Conflict in Vietnam (D) $25
F-15 Strike Eagle (D) $23
Gunship (D) $23
Kennedy Approach(D) $23
Silent Service (D) $23
MINDSCAPE
Bank St. Music Writer (D) $19
Bank St. Storybook (D) $19
Bop & Wrestle (D) $19
Color Me: The Computer Coloring Kit (D) $19
Great British Software (D) $12
Halley Project (D) $19
Indiana Jones (D) $19
Infiltrator (D) $19
Luscher Profile (D) $19
Perfect Score SAT (D) $44
Spell of Destruction(D) $19
MIRAGE
Database w/Report Generator (D) $33
Professional Word Processor (D) $33
MISC
Bob's Term 128 $49
CSM 1541 Align Kit (D) $29
Central Point-Copy 2 (D) $23
Gato (D) $19
Snapshot 64 (R) Call
Superbase 64 (D) $47
Superbase 128 (D) $59
Superscript 64 (D) $47
Superscript 128 $47
Vizastar 64 XL8 (D) $79
Vizastar 128 (D) Call
Vizawrite 128 (D) Call
ORIGIN
Ultima 3 (D) $34
Ultima 4 (D) $39
PROFESSIONAL SOFTWARE
Fleet System 2—W.P. w/70,000 word spell checker 64 or 128 $39
Fleet System 3 (128) $49
RANDOM HOUSE
Alpine Encounter (D) $14
Charlie Brown's ABC's (D) $14
Snoopy's Reading Machine (D) $14
Typing Is A Ball, Charlie Brown (D) $14
SCARBOROUGH
Boston Computer Diet (D) $33
Build A Book (D) $16
Mastertype (D) $25
Net Worth (D) $44
SIERRA
Champ. Boxing (D) $16
Donald Duck's Playground (D) $16
Goofy's Word Factory(D) $16
Grog's Revenge (D) $16
Mickey's Space Adventure (D) $16
Stunt Flyer (D) $16
Winnie the Pooh (D) $16
Wiz Type (D) $16
SIMON & SCHUSTER
Great International Paper Airplane Construction Set(D) $19
Star Trek-The Kobayashi Alternative (D) $25
Typing Tutor 3 (D) $25
SPINNAKER
Adventure Creator (R) $9
Alphabet Zoo (R) $9
Alf in Color Cave (R) $9
Bubble Busters (R) $9
Cosmic Combat (R) $9
Delta Drawing (R) $9
Facemaker (R) $9
Fraction Fever (R) $9
Gold Record Race (R) $9
Homework Helper-Math Word Problems (D) $23
Homework Helper-Writing (D) $23
Invaders Lost Tomb(D) $19
Kids on Keys (R) $9
Kung Fu 1—Exploding Fist (D) $19
Kung Fu 2—Sticks of Death (D) $19
SPRINGBOARD
Early Games (D) $21
Easy as ABC (D) $23
Fraction Factory (D) $19
Newsroom (D) $33
N.R. Clip Art Vol. 1 (D) $19
N.R. Clip Art Vol. 2 (D) $25
Stickers (D) $23
SSI
Battle Group (D) $37
Battle of Antietam(D) $33
Battalion Commander(D) $25
Colonial Conquest (D) $25
Computer Ambush (D) $37
Computer QB (D) $25
Field of Fire (D) $25
Gemstone Warrior (D) $23
Germany 1985 (D) $37
Gettysburg (D) $37
Kampfgruppe (D) $37
Mech Brigade (D) $37
NAM (D) $25
Norway 1985 (D) $23
Phantasie (D) $25
Phantasie 2 (D) $25
Questron (D) $25
Rings of Zilfin (D) $25
U.S.A.A.F. (D) $37
Wings of War (D) $25
Wizard's Crown (D) $25
SOFTSYNC
Desk Manager 64 or 128 (D) $25
Trio 128 (D) $43
SUBLOGIC
Flight Simulator 2 (D) $32
F.S. Scenery Disks Call
Football (D) $29
Jet (D) $29

TELARIUM
Amazon (D) $21
Fahrenheit 451 (D) $21
Dragon World (D) $21
Rendezvous w/Rama (D) $21
Nine Princes in Amber (D) $21
Perry Mason: Case of the Mandarin Murder (D) $21
TIMEWORKS
Accts. Payable (D) $39
Accts. Receivable (D) $39
Data Manager 2 (D) $33
Data Manager 128 $43
Electronic Checkbook (D) $16
Evelyn Wood Dynamic Reader (D) $33
General Ledger (D) $39
Inventory Mgmt (D) $39
Money Manager (D) $16
Partner 128 $39
Payroll Mgmt. (D) $39
Sales Analysis Mgmt (D) $39
Sideways 64 or 128 $33
Swiftcalc/Sideways(D) $33
Swiftcalc/Sideways (128) $43
Sylvia Porter's Personal Financial Planner(D) $39
Sylvia Porter's Personal Financial Planner 128 $43
Word Writer w/Speller (D) $33
Word Writer w/85000 Word Speller (128) $43
TRONIX
S.A.M. (D) $39
UNISON WORLD
Art Gallery 1 (D) $16
Print Master (D) $23
WEEKLY READER
Stickybear ABC'S (D) $19
Stickybear Math (D) $19
Stickybear Numbers(D) $19
Stickybear Reading (D) $19
Stickybear Shapes (D) $19
ACCESSORIES
Anchor 6470 300/1200 Modem w/Software $149
Bonus SS, DD $6.99 Bx
Bonus DS, DD $7.99 Bx
Compuserve Starter Kit $19
Datashare Printer Int. w/Graphics (PPI) $33
Disk Case (Holds 50) $9
Disk Drive Cleaner $9
Disk Notcher $7
Dow Jones News Retrieval Kit (5 hrs.) $14.
Kraft Joystick $9
Panasonic 1080 100 cps dot matrix printer **Great Deal**
Sakata 13" Color Composite Monitor for C64 $139
Teknika MJ22 RGB/comp monitor for C128 Call
Total Auto Answer/Auto Dial Modem w/Software $24.88
Universal Printer Stand $16
Wico Bat Handle $17
Wico Boss $12
Verbatim Bulk 5¼ SS, DD $59/100

P.O. BOX 111327—DEPT. CG BLAWNOX, PA 15238

***Ordering and Terms:** Orders with cashier check or money order shipped immediately. Personal/company checks, allow 3 weeks clearance. No C.O.D.'s. **Shipping: Continental U.S.A.**—Orders under $100 add $3; **free shipping on orders over $100.** PA residents add 6% sales tax. **AK, HI, FPO-APO**—add $5 on all orders. Sorry—no International orders. Defective merchandise will be replaced with same merchandise. Other returns subject to a 15% restocking charge—NO CREDITS! Call for authorization number: (412) 361-5291. Prices subject to change without notice. **Modem Owners: Type Go SDA on Compuserve's Electronic Mall to see our On-Line Catalog of over 800 software titles for Atari, Commodore, Apple, & IBM. Summer Hours Mon.-Fri. 9 A.M.-5:30 P.M. EDT • Sat. 10 A.M.-5 P.M. EDT**

YOU CAN DO A LOT MORE WITH MUSIC THAN YOU'RE DOING NOW!

— Did you play an instrument in school?
— No matter what your musical background is, these new computer music products will bring out your talents!

FUTURE MUSIC

MIDI
HARDWARE
SOFTWARE

- SYNTHESIZERS AND DRUM MACHINES
- COMPUTER SOFTWARE AND HARDWARE
- SEQUENCERS, PROGRAMMERS
- HOME RECORDING EQUIPMENT

USE YOUR COMMODORE 64!

$34.95 MUSIC SHOP SOFTWARE
SAVE $15 Write music by pointing and clicking your joystick. 4 staffs at once. Play back any tempo or key. Print your score!

$99.95 MUSIC SHOP WITH MIDI
SAVE $50 Even better yet! Your computer can now play any MIDI synthesizer! Perfect for the CZ101, with 4 different sounds at once! You can write with the keyboard!

$99.95 MIDI INTERFACE FOR C64
SAVE $30 Required to use MIDI software and MIDI synthesizers with Commodore 64/128.

$89.95 EDITOR/LIBRARIAN FOR CZ101
SAVE $10 Great for making your own CZ sounds!

$64.95 SYNTECH MIDI STUDIO (SEQ)
SAVE $15 Best low cost MIDI sequencer!

10-DAY SATISFACTION GUARANTEED

WE HAVE MANY MORE PRODUCTS AVAILABLE. IF YOU DON'T SEE WHAT YOU WANT HERE, CALL US!

NEW! AMIGA AND ATARI ST!

CALL FOR LATEST MUSIC PRODUCT INFORMATION

APPLE II SERIES	List	Sale
Passport Interface	$149	$119
IIC Interface	299	239
Passport Midi 4+ (Seq)	129	99
Passport Leadsheeter (Not)	149	109
Yamaha DX Editors	From 89.95	
Casio CZ101 Editors	From 89.95	
Textures Sequencer	99	84
Educational Software	CALL!	
MACINTOSH		
Deluxe Music Const. Set	79	49
Mark of the Unicorn (Seq)	295	260
Mark of the Unicorn (Not)	495	445
MAC Interfaces	From 75.00	
MAC Synth Editors	From 40.00	
IBM MUSIC SOFTWARE	CALL!	
KEYBOARD, SYNTH., ETC.	CALL!	
CZ SERIES 64 VOICE CART.	45	37
4 TRACK RECORDERS	CALL!	
DRUM MACHINES	CALL!	
ATARI 800/130XE MIDI SYSTEM	CALL!	

START YOUR COMPUTER MUSIC SYSTEM TODAY

$299 CASIO CZ101 SAVE $200

PROFESSIONAL SYNTHESIZER SOUND, UP TO 4 UNIQUE SOUNDS AT ONCE, MIDI, PROGRAMMABLE, PORTABLE, EASY TO USE — THE STANDARD —

FREE AC ADAPTER & SHIPPING

BOOKS ON MIDI, MIDI PRODUCTS

Understanding Midi - 82 Pages w/Product Guide	3.95
How to Understand & Program the DX7	24.95
Synthesizer Technique	8.95

Send cost plus $1.50 postage and handling to the address below or call toll free to order.

FUTURE MUSIC IS THE ONLY MUSIC STORE DEVOTED TO COMPUTER ENTHUSIASTS & HOME MUSICIANS.

MASTERCARD AND VISA ACCEPTED
CALL 24 HRS. TOLL FREE!
1-800-FOR-MIDI

FUTURE MUSIC, 1465 Terminal Way. Mail Orders and Correspondence to: Box 1090, Reno, NV 89504. Nevada Call 702-826-MIDI. Cust. Service 702-359-MIDI; 9-6 PDT

DISKS 50¢ • PRINTERS • commodore 64 EDUCATOR

☑ LIFETIME WARRANTY
☑ TYVEK SLEEVES • LABELS
WRITE PROTECTS • PACKAGED

FACTORY NEW — 1st QUALITY

	50-99	100-999	1000+
GENERIC SS/DD	.60	.55	.50
BASF DS/DD	1.00	.95	.90

Verbatim.

	50-99	100-999	1000+
SS/DD	1.00	.95	.90
DS/DD	1.50	1.40	1.30

BY COMMODORE AMIGA™
GIVES YOU A CREATIVE-EDGE
NEW LOW PRICE CALL!

M.C.S.
MicroComputer Services
800-433-7756
In Michigan (313) 427-0251
INFO & CUSTOMER SERVICE — (313) 685-7766
HOURS: MON - SAT 10:00 A.M. - 6:00 P.M.
15076 Middlebelt, Livonia, MI 48154

Canon PJ-1080A
COLOR INK JET
$249.95
LIMITED TIME OFFER

star GEMINI 10X
$149.95
120 CPS
FRICTION & TRACTOR

NEW! star NX-10
$239.95
N.L.Q. • SHEET FEEDER
REAR TRACTOR/FRICTION
5K BUFFER

SEIKOSHA SP-1000
COMMODORE READY
$179.95
NEAR LETTER QUALITY
FRICTION & TRACTOR
100 CPS • 1.5K BUFFER

COMREX CR-220
$79.95
COMMODORE READY
FROM EPSON
50 CPS • TRACTOR FEED

We Bought 'em All FAR BELOW DEALER COST

RETAIL
499.95

REGULAR DEALER COST
325.00

- 100% C-64 Compatible
- Built in Hi-Res Green Monitor
- Heavy duty power supply and sturdy case
- All units completely refurbished with full 90 day warranty

$199.95
SPECIAL QUANTITY DISCOUNTS

MC/VISA/C.O.D.
Dealer Inquiries Invited
All prices discounted for cash or check, add 3% for MC/VISA. Shipping: Printers $10.00, Educator $20.00, Disks $4.00 per 100. (West Coast — add $2.00 per order). Add $2.00 for C.O.D. Reduced shipping for large quantities. Prices and availability subject to change without notice. ALL MERCHANDISE CARRIES MANUFACTURERS WARRANTY.

COMB

Authorized Liquidator

PUBLIC NOTICE

We are an authorized liquidator of consumer products that must be quickly sold at drastic price reductions for many reasons, such as:

Discontinued lines. Last year's models. Distributor's surplus. Cancelled orders. Bankruptcy. Factory overproducton. Out-of-season products. Tailends of inventories.

Whatever the reason for the liquidation you are assured of fine quality at money-saving low prices! Supplies are limited. Order now!

COMMODORE COMPATIBLE HARDWARE

SEE YOUR GAMES IN COLOR!

Save On A Factory New Discontinued Model

COMREX™ by EPSON®

13" COLOR MONITOR

- Liquidation of a discontinued model.
- Can be used with your VCR.
- Superior color picture quality.
- Manual controls for tint, color, contrast, horizontal, center and vertical hold.
- Power indicator light, video and sound input terminals.
- 270 line resolution.
- 40 character (8 x 8) x 24 line display.
- Size: 14" H x 13¾" W x 15½" D.
- Does not include connection cable. (Contact local stores.)

Compatible with Commodore 64K™ and Apple II® Series

Limited Factory Warranty: 2 Years on Parts and Labor; 3 Years on Picture Tube

Mfr. List Price . $249.00

Liquidation Price $149

Item H-1381-7003-809
Shipping, handling: $12.00

FAMOUS U.S. BRAND

Sorry, we are not permitted to print the famous brand name. But we can tell you if you call us Toll-Free.

DISK DRIVE

Are you still wasting time using just ONE drive? Buy a SECOND drive to make quick back-up copies...and to use double-drive software with ease.

- Commodore compatible (C64, SX64).
- 2K RAM, 16K ROM. Maximum storage of 170K formatted data, 35 tracks.
- Uses 5¼" floppy diskettes.
- Serial interface.

These are factory reconditioned units, warranted by the U.S. manufacturer!

Original List Price . . . $269.00

Liquidation Price . . . $149

Item H-1381-3553-013
Shipping, handling: $8.00

COMMODORE TRACTOR FEED

Liquidation is due to discontinued model. Now use continuous paper AND single sheets in your Commodore 803. Quickly snap in this tractor feed unit. When installed, you can still use your friction feed, too!

90-Day Limited Factory Warranty.

Mfr. List: $39.95

Liquidation Price . . $19

Item H-1381-7004-286
Shipping, handling: $4.00

Famous Brand LETTER QUALITY PRINTER

- Commodore compatible (C64, SX64, Plus/4, C15, VIC20).
- Add to your present equipment for office quality appearance of letters, reports.
- Prints 18 cps. Bi-directional printing.
- Triumph-Adler compatible printwheel.
- Upper/lower case letters, numerals, symbols.
- Spacing: 10, 13, 15 cpi. or proportional selectable. 48 lines per inch maximum.
- 13" max. paper width (11" printable width).

Original List: $395.00

Liquidation Price $188

Item H-1381-4184-016 Shipping, handling: $11.50

Factory Reconditioned With Factory Warranty.

C.O.M.B. Direct Marketing Corp. **Item H-1381**
14605 28th Ave. N./Minneapolis, MN 55441-3397

Send items shown at right. (Minnesota residents add 6% sales tax. Sorry, no C.O.D. orders.)

☐ My check or money order is enclosed. (No delays in processing orders paid by check, thanks to TeleCheck.)

Charge: ☐ VISA* ☐ MasterCard* ☐ American Express*

Acct. No. ______ Exp. __/__

PLEASE PRINT CLEARLY

Name ______

Address ______

City ______

State ______ ZIP ______

Phone (   ) ______

Sign Here ______

SEND ME THE ITEMS I HAVE LISTED BELOW

Sales outside the 48 contiguous states are subject to special conditions. Please call or write to inquire.

Item No	#	Item	Price	S/H

Credit card customers can order by phone, 24 hours a day, 7 days a week.

VISA MasterCard AMERICAN EXPRESS

Toll-Free: 1-800-328-0609

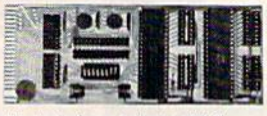
TeleCheck **Your check is welcome! No delays in orders paid by check.**

Sales outside the 48 contiguous states are subject to special conditions. Please call or write to inquire.

COMB Direct Marketing Corp.
Authorized Liquidator
14605 28th Avenue North
Minneapolis, Minnesota 55441-3397

THE ULTIMATE CONTROL INTERFACE

Compatible with C64,
C128 in 64 & 128 modes,
and C128 in CP/M mode



Universally applicable dual 6522 Versatile Interface Adapter (VIA) board. Intelligently control almost any device. Perform automated testing. Acquire data for laboratory and instrumentation applications. Provides four 8-bit fully bidirectional I/O ports & eight handshake lines. Four 16-bit timer/counters. Full IRQ interrupt capability. Expandable. Includes extensive documentation and programs on disk. $169 postpaid USA. Each additional board $149.

SYMBOL MASTER *MULTI-PASS SYMBOLIC DISASSEMBLER*

The original and best is now even better with Version 2.0! Disassembles any 6502/6510/undoc/65C02/8502 machine code program into beautiful source. Includes both C64 & C128 native mode versions. Learn to program like the experts! Adapt existing programs to your needs! Outputs source code files to disk fully compatible with your MAE, PAL, CBM, Develop-64, LADS, Merlin or Panther assembler, ready for re-assembly and editing. 100% machine code and extremely fast. 63-page manual. Advanced and sophisticated features far too numerous to detail here. $49.95 postpaid USA.

PROFESSIONAL UTILITIES & RESOURCES

- C64 Source Code. Most complete available reconstructed, extensively commented and cross-referenced assembly language source code for Basic and Kernal ROMs, all 16K. In book form, 242 pages. $29.95 postpaid USA.
- PTD-6510 Symbolic Debugger for C64. An extremely powerful tool with capabilities far beyond a machine-language monitor. 100-page manual. $49.95 postpaid USA.
- MAE64 version 5.0. Fully professional 6502/65C02 macro editor/assembler. 80-page manual. $29.95 postpaid USA.

SCHNEDLER SYSTEMS

1501 N. Ivanhoe, Dept. G8, Arlington, VA 22205
Information/Telephone Orders (703) 237-4796. VISA/MasterCard

COMPUTE!'s Gazette Subscriber Services

Please help us serve you better. If you need to contact us for any of the reasons listed below, write to us at:

COMPUTE!'s Gazette
P.O. Box 10957
Des Moines, IA 50340

or call the Toll Free number listed below.

Change of Address. Please allow us 6–8 weeks to effect the change; send your current mailing label along with your new address.

Renewal. Should you wish to renew your Gazette subscription before we remind you to, send your current mailing label with payment or charge number or call the Toll Free number listed below.

New Subscription. A one-year (12-month) U.S. subscription to *COMPUTE!'s Gazette* is $24 (2 years, $45; 3 years, $65. For subscription rates outside the U.S., see staff page). Send us your name and address or call the Toll Free number listed below.

Delivery Problems. If you receive duplicate issues of *COMPUTE!'s Gazette*, if you experience late delivery, or if you have problems with your subscription, please call the Toll Free number listed below.

COMPUTE!'s Gazette
1-800-247-5470
In IA 1-800-532-1272

Free Spirit Software, Inc.

Music of the Masters - $9.95
One full hour of classical music on disk for the C64 or C128 in 64 mode. Screen commentary on the various composers. Mozart, Handel, Beethoven & many more!

Music of the Master, Volume II - $9.95
More classical music from the world's greatest composers. Waltzes, minuets, sonatinas and other compositions by Chopin, Schubert, Brahms, Mozart & many more! Includes a special study on the Bach family. For C64 or C128 in 64 mode.

SPECIAL OFFER! Order both volumes of Music of the Masters for only $16.95!

BASICally SIMPLE 64 - $14.95
How to use all C64 Basic 2.0 commands and operators in Basic programs. Everything explained in clear, concise terms. After you become an expert programmer, this disk makes a handy reference guide.

BASICally SIMPLE 128 - $19.95
How to use all C128 Basic 7.0 commands and operators in Basic programs. Instruction in graphic, sound and music commands included. Hundreds of easy to follow examples provided on this 128 mode disk.

TECHNIQUE! - $19.95
Easy, direct instruction in programming graphics, animation, sound and music on the C64. Disk includes machine language music program, several tunes and an example game.

Free shipping & handling for U.S. orders! Illinois residents add 7% sales tax. Send check or money order to:

Free Spirit Software, Inc.
5836 S. Mozart
Chicago, Illinois 60629

CONVERSE WITH YOUR COMPUTER

AT LAST! A FULL IMPLEMENTATION of the original ELIZA program is now available to run on your Commodore 64!

Created at MIT in 1966, ELIZA has become the world's most celebrated artificial intelligence demonstration program. ELIZA is a non-directive psychotherapist who analyzes each statement as you type it in and then responds with her own comment or question—and her remarks are often amazingly appropriate!

Designed to run on a large mainframe, ELIZA has never before been available to personal computer users except in greatly stripped down versions lacking the sophistication which made the original program so fascinating.

Now, our new Commodore 64 version possessing the **FULL** power and range of expression of the original is being offered at the introductory price of only **$25**. And if you want to find out how she does it (or teach her to do more) we will include the complete **SOURCE PROGRAM** for only **$20** additional.

Order your copy of ELIZA today and you'll never again wonder how to respond when you hear someone say, "Okay, let's see what this computer of yours can actually do!"

READ WHAT THE EXPERTS SAY ABOUT OUR VERSION OF ELIZA:

"Much more than a mere game...You'll be impressed with ELIZA...A convincing demonstration of Artificial Intelligence." —*PC MAGAZINE*

"Delightful entertainment...An ideal medium for showing off your system." —*MICROCOMPUTING MAGAZINE*

"ELIZA is an astounding piece of software...A fascinating program to use and study." —*BARON'S MICROCOMPUTER REPORTS*

"ELIZA is a great way to introduce your friends to computers...A very funny party game." —*PETER A. McWILLIAMS*

"ELIZA is an exceptional program, one that's fun to use, shows off your machine, and has great historical interest." —*POPULAR COMPUTING MAGAZINE*

"This version of ELIZA is the best we have seen. As a party game, it is unmatched." —*HOME APPLICATIONS FOR THE C-64*

ELIZA IS AVAILABLE IN THE FOLLOWING FORMATS:
(Please specify Disk or Cassette)

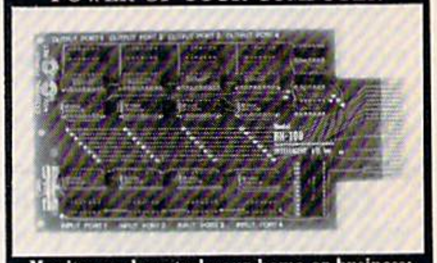
1. Protected Version $25
   (Protected Version can be run but not listed or modified)
2. Un-protected Commodore 64 BASIC Source Version $45
   (Source Version can be listed and modified as well as run)

Both versions include a six page user manual.

Please add $2.00 shipping and handling to all orders
(California residents please add 6½% sales tax)

ARTIFICIAL INTELLIGENCE RESEARCH GROUP
921 North La Jolla Avenue, Dept. G
Los Angeles, CA 90046
(213) 656-7368 (213) 654-2214
MC, VISA and checks accepted

DISCOVER THE HIDDEN POWER OF YOUR COMPUTER



Monitor and control your home or business:

- Control lights, appliances, heating/cooling systems, relays, motors and virtually any electrical device.
- Connect to temperature, light, sound, moisture, fluid level, pressure and vibration sensors - plus many more.
- Use as an advanced security system.
- Perform automated testing and experimentation.
- Use as a sophisticated laboratory data acquisition system.
- Use for educational purposes.

Provides 8 memory mapped ports:

- Allows access to each port via one statement in BASIC. No interface could be easier to use.
- 4 8-bit buffered output ports (32 separate output lines).
- 4 8-bit input ports (32 separate input lines).
- 8 convenient 14-pin DIP socket interface connectors.
- **1 channel A/D plug-in conversion module with 100 microsecond sampling time: $25.**
- **8 channel A/D plug-in conversion module with 100 microsecond sampling time: $50.**
- BH100 User Manual includes instructions, sample programs and diagrams of typical hookups.

The BH100 is a very powerful and versatile interface. Do not let the price fool you-

ONLY $129!

Specify C-64, VIC-20 or Apple 2+/2e

Intelligent I/O. Inc.
30 Lawrence Ave., Box 70
Potsdam, NY 13676
(315) 265-6350

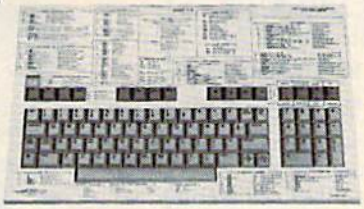
Please add
$2 for postage

Bulk rates available

LEROY'S CHEATSHEET®
KEYBOARD OVERLAYS

NEW

ONLY $7.95 EACH



PLASTIC LAMINATED

COMMODORE 128
DIE-CUT

- ☐ BASIC 7.0
- ☐ BLANKS (set of 3 not laminated)
- ☐ DISK 1571
- ☐ EASY SCRIPT
- ☐ FLEET SYSTEM 2 & 3
- ☐ FOR THE BEGINNER
- ☐ MULTIPLAN
- ☐ PAPER CLIP 128
- ☐ SUPERBASE 128
- ☐ WORDPRO 128

FREE Keyboard Extender With C-128 Order

ONLY $3.95 EACH

COMMODORE 64
CUT-OUT-YOURSELF ON DOTTED LINES

- ☐ BASIC
- ☐ BLANKS (set of 3)
- ☐ CALC RESULT ADVANCED
- ☐ CALC RESULT EASY
- ☐ COMAL
- ☐ CONSULTANT
- ☐ DISK 1541
- ☐ DOODLE
- ☐ EASY CALC
- ☐ EASY SCRIPT
- ☐ FLEET SYSTEM 2
- ☐ FLIGHT SIMULATOR II
- ☐ LOGO sheet 1
- ☐ LOGO sheet 2
- ☐ MANAGER
- ☐ OMNIWRITER
- ☐ PAPERCLIP
- ☐ PILOT
- ☐ PRACTICALC II
- ☐ PRACTICALC 64
- ☐ FOR THE BEGINNER
- ☐ HES MON 64
- ☐ HES WRITER
- ☐ MULTIPLAN
- ☐ SCRIPT 64
- ☐ SIMONS' BASIC
- ☐ SKY TRAVEL
- ☐ SMART 64 TERMINAL
- ☐ SPEEDSCRIPT
- ☐ SPRITES ONLY
- ☐ SUPERBASE 64
- ☐ TERM 64
- ☐ VIDTEX
- ☐ VIP TERMINAL
- ☐ VIZASTAR
- ☐ WRITE NOW! /64
- ☐ 801/803 PRINTER
- ☐ 1526/802 PRINTER
- ☐ EPSON RX/FX 80
- ☐ GEMINI 10X, 15X
- ☐ OKIDATA 92/93

- ✓ SAVES TIME - ENDS FRUSTRATION
- ✓ GET TO KNOW YOUR SOFTWARE BETTER
- ✓ FITS OVER KEYBOARD
- ✓ COMMANDS AT YOUR FINGERTIPS
- ✓ LEARN NEW SOFTWARE FASTER, EASIER
- ✓ STURDY PLASTIC LAMINATE
- ✓ UNBEATABLE PRICE!!

LEROY'S CHEATSHEETS® are durable plastic laminated keyboard overlays designed for use with popular software, hardware, and languages for the **Commodore 64** and **128**. When laid on your keyboard, **LEROY'S CHEATSHEETS**® surround the keys with essential information, placing your most valuable computing tool at your fingertips.

We take time to learn and use each program before designing a Cheatsheet. For quick reference, commands are grouped according to function. The actual keystrokes are in **bold** type and variables are shown in *italics*. ALL the COMMANDS are included, and many extra shortcuts are added.

Now you can use your software faster, more easily and more effectively. With **LEROY'S CHEATSHEETS**® you'll never have to hunt for a program command again.

SOFTWARE !!!

NOW buy your SOFTWARE from LEROY at **20% OFF** list price (hundreds of titles available)

SPECIAL OFFER

Buy any software package (minimum $25.00 order) and get a ***FREE*** **LEROY'S CHEATSHEET**® of your choice!

Superscript EPYX. Mindscape BATTERIES INCLUDED MICROSOFT MULTIPLAN. Fleet System 3 Superbase SPRINGBOARD Broderbund Software

NEW

THE PROBLEM SOLVER
EQUIPMENT STAND
By LEROY

LIST $24.95
SPECIAL
$19.95
plus shipping

SPECIALLY DESIGNED FOR COMMODORE COMPUTERS

VINYL COATED - 1/4" DIAMETER
WELDED STEEL CONSTRUCTION
18" WIDE 4" HIGH 11" DEEP
PUTS YOUR CRT AT EYE LEVEL

ORGANIZE YOUR SYSTEM
KEEPS EQUIPMENT COOLER
PERFECT FOR PRINTERS
☐ EQUIPMENT STAND

SHIPPING AND TERMS: **OVERLAYS** $1.00 shipping per order U.S. & Canada
$3.00 for foreign orders
STANDS $3.00 shipping EACH 48 states
$5.00 Canada, Hawaii, Alaska
U.S. funds NO C.O.D.

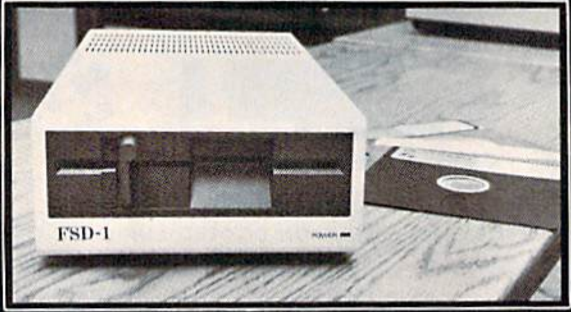
CPi *CHEATSHEET PRODUCTS INC*
P.O. Box 111368
PITTSBURGH, Pa. 15238
(412) 781-1551

VISA MasterCard

GAZ8

SUBTOTAL ______ SHIPPING ______
6% TAX PA. RESIDENTS ______
TOTAL OF ORDER ______
MC/VISA # ______ EXPIRES ______
NAME ______
ADDRESS ______
CITY ______ STATE ______ ZIP ______

Commodore Compatible and only. . . $139.00



FSD-1 5¼"Disk Drive

Directly replaces the Commodore 1541 disk drive.

The FSD-1 Disk Drive is a versatile and efficient disk drive built for the Commodore series of personal computers. This disk drive is fully compatible with the Commodore 64 computer and directly replaces the Commodore 1541 Disk Drive, giving much better performance in terms of data loading and writing speed and memory buffer size.

Special Features

- Full 6 month warranty—your assurance of quality
- Slim line construction—to fit in those smaller places
- Vented metal chassis—to run cool and efficient always
- Dual serial port with chaining option for expandability
- 5¼" industry standard format
- Positive lever lock—to eliminate the "pop out" problem
- Built especially for C-64 users

Remember, no sales tax in Oregon.

To Order call toll free 1-800-356-5178

Visa and MasterCard are welcome. Allow $8.00 shipping and handling. Or mail your order with check or money order to:

ECI

Emerald Component International
541 Willamette Street
Eugene, OR 97401
Tel. 503-683-1154

NEW

for the Commodore 128

DON'T GIVE UP YET!

BACK UP
virtually all 64/128 Software with
NEW 1571 Clone*

Months of R&D have gone into the GCR CLONE MACHINE™ for 1571. Now you have the ability to reproduce GCR signals to back up virtually all software for the 64/128 including CPM (double sided too!). Included are:
1) Full Density Utility 2) GCR Copy 3) Directory Utilities 4) Auto Boot Maker (64&128 Modes) 5) Expansion module section (for future updates).
ALL THIS for only **$49.95**

PRINTER INTERFACE

The MW-350 interface has been revised to fully support the 128 including complete CPM emulation total graphics, correct aspect ratios, print buffer, etc. Insist on compatability for only **$79.00**

MIDI APPLICATIONS

Synthesizers, Interfaces, Music Disks, Sequencer Software, Etc.

CALL - 201 - 838-9027
or write us at
Micro-W.
DISTRIBUTING, INC
1342B Route 23 Butler, N.J 07405

*requires 128 with 1571 drive

LOTTO CIPHER™

GET THE BEST ODDS ON ANY LOTTERY
SIX NUMBER - PICK FOUR - DAILY GAME

- PRODUCES FOUR COMBINATIONS OF NUMBERS TO CHOOSE FROM.
- ANY AMOUNT OF BALLS AND NUMBERS CAN BE PROGRAMMED.
- PRINTS OUT PAST LOTTO NUMBERS DRAWN, PAST COMPUTER PICKS, AND NUMBER DRAW FREQUENCY LIST.
- COMPLETE NUMBER DATA BASE.

$29.95 C-64 DISK

Window Magic

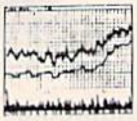
SUPER HI-RESOLUTION DRAWING IN MULTI OR MONO COLOR

• POLYGON SHAPES - EXPAND, SHRINK AND ROTATE. THEN STAMP ANYWHERE • ZOOM - EXPANDS A WINDOW TO DOUBLE SIZE • MIRROR, FLIP, AND SCROLLING WINDOWS • COPY • CLONE COLOR ATTRIBUTES • ZOOM PLOT - DRAW ON AN EXPANDED WINDOW AND YOUR DRAWING AT THE SAME TIME • SAVE AND LOAD YOUR WINDOWS ON DISK • PRINTS ON STANDARD DOT MATRICS PRINTER • FILL • LINES • DRAW • TYPE LETTERS AND GRAPHICS • COLOR SQUARES

$24.95 C-64 DISK

STOCK BROKER™

PROFITS GUARANTEED OR YOUR MONEY BACK



BUYING GOOD QUALITY, VOLATILE ISSUES AND USING THE TRADING SYSTEM WILL HAVE YOU FULLY INVESTED AT THE LOWEST PRICES AND CONVERTING TO CASH AS THE STOCK NEARS ITS PEAK.

- TECHNICAL TRADING THAT WORKS.
- BAR GRAPH PRINT-OUTS.
- RECORD UP TO 144 STOCKS ON A DISK.

$39.95 C-64 DISK

ABANDON SHIP™

S.O.S.

HI-RES ARCADE STYLE GAME THAT REQUIRES STRATEGY AND JOYSTICK SKILLS. THERE ARE 52 ROOMS IN THE HMS BLACK. THE BRIDGE, ENGINE ROOM, ARMORY, AND SUPPLY ROOM ARE THE MOST IMPORTANT TO PROTECT.
GIVE MY REGARDS TO DAVEY JONES.

$21.50 C-64 DISK

ACORN OF INDIANA, INC.
2721 OHIO STREET
MICHIGAN CITY, IN 46360

219-879-2284

SHIPPING AND HANDLING, ADD $1.50 - C.O.D.'S ACCEPTED
VISA AND MASTER CARD ORDERS ADD 4%
INDIANA RESIDENTS ADD 5% SALES TAX

WHERE DO SIGNS COME FROM?
THE BANNER MACHINE

SIGNS, BORDERS, BACKGROUNDS BY:
THE BANNER MACHINE
$49.95

Order Now!
800 762-5645

CARDINAL SOFTWARE 14840 BUILD AMERICA DR.
WOODBRIDGE, VA 22191 INFO (703) 491-6494

Classified

SOFTWARE

FREE SOFTWARE for C64, C128, IBM, & CPM send SASE for info (specify computer) to:
PUBLIC DOMAIN USERS GROUP,
PO Box 1442-A2, Orange Park, FL 32067

COMMODORE: TRY BEFORE YOU BUY. Top 25 best-selling games, utilities, new releases. Visa, MasterCard. Free brochure. Rent-A-Disk, 908 9th Ave., Huntington, WV 25701 (304) 522-1665

FREE MEMBERSHIP IN SOFTWARE CLUB. Top British C64 programs. Catalog and reviews (no strings). ARROW EXPRESS, Box 205-G8, Rossland, BC VOG 1Y0

Play INSANE WE TRUST! The West Coast favorite for the C-64 on disk. Tricky quiz-type game. Only $6 to: Tom Balvin, 2555 Altura Ave., Montrose, CA 91020

BASEBALL PLAYERS/COACHES. Display, save, print your team's roster & complete statistics (up to 20 players/team). C64 & 128. Disk $19.95 (mbg). Scoreboard Software, Dept. G5, POB 31566, Phoenix, AZ 85046. (602) 992-4072

VEGAS–Casino Games for the C64. Includes: Blackjack, Slots, Poker, Keno, Baccarat, Chuck-a-luck. All for only $14.95. PAR Value Software, PO Box 1818, Vicksburg, MS 39180

ATTENTION COMMODORE GRAPHIC BBS USERS! Get the ultimate graphic message maker! GRAPHIC MAGIC V3.0! On-screen menus! Easy editing! Printouts! FREE ColorDisk sample! Only $9.95! PACIFIC DISTRIBUTING, 801 E. Harrison St., Seattle, WA 98102

ELECTROCALC can do your electronics calculations: Resonance, crossover, etc. C64 or 128 (specify)—$19.95 postpaid. NOVASOFT, Rt 1, Box 107B, Kinston, NC 28501

Play HEARTS on C64 against 3 computer-card experts. Several game variations. Send $19.95 to Barry Miller, 258 Toftrees Ave. #216, State College, PA 16803

PRO FOOTBALL FANS. WEEKLY PREDICTIONS with your C64. Team stats analyzed to pick winner. With or without point spread. Cumulative stats. Menu driven. Disk $21.95. Kelkris, 433 Viola, Hubbard, OH 44425

LOWEST PRICES IN AMERICA, for C64 software. Send $2 for sample disk of over 30 programs and catalog of 8000+ programs. FRUGALWARE, 23 E. Green, W. Hazelton, PA 18201

DIRECT SALES DISTRIBUTOR'S HELPER - C64 Does inventory, order forms, reports and more. $59.95. Send SASE for free demo kit. RD3 Box 413, Kunkletown, PA 18058

MUST games for C64/128 owners! Las Vegas, Monopoly 64/128, Songs & Sounds, Brain Game. @ $9.95, all four $35.95 ch/m.o. to: DCS, 2254 Pacifica, L. Beach, CA 90806 (213)595-0899

BRIDGEBRAIN: Full-featured, user-friendly contract bridge for C-64. $30 (T or D) or $1 for info to: George H. Bodner, PhD, 1134 Harvard Circle, Pittsburgh, PA 15212

SAVE $ ON INTEREST/MORTGAGES/ALL LOANS. "PREPAYMENT" gives hard facts to show ways to cut $ from any loan at any given time. Plus utilities. $19.95 + $2 p/h. C64 disk. WILCAR INC., P.O. Box 8111, Phx, AZ 85066

PRINTSHOP™ OWNERS
Four new C-64 Graphics Collection disks
Scenes, Symbols, Animals, Holidays
60 graphics per disk—Each disk $9.95
Write to VISION-Soft, 320 N. Monterey, Farmington, NM 87401 for more information.

BASEBALL TRIVIA QUESTIONS for C64/128. 300 questions from past and present. Disk $16.95 CH/MO to Triple Play Software, P.O. Box 493, Fairfax, VA 22030

LAS VEGAS/ATLANTIC CITY CASINO ACTION! 20 superior games. Blackjack, 21, Craps, Poker, Slots. C64/128. $12.95: M. ADAMS, 6547 N. Acad, #446-A1, C. Spgs, CO 80907

HARDWARE

NEW FOR C-64 - SPEECH SYNTHESIZER! has third generation voice chip, male, female voices, sings. Kits/Finished Units! SASE to SJ, Box 11205, Clearwater, FL 33516

ATTENTION COMMODORE 64 MODEM OWNERS: Convert any Commodore 64 modem to RS-232 format! Easy to build interface allows you to use your modem with IBM, Amiga, 520 ST, or any computer with an RS-232 port. Send $10.00 for complete plans to: LEE CONSULTING, 14810 NE 1 St. #D, Bellevue, WA 98007

PHOTO AND $5 GETS C64-GENERATED "Master" for personalized stationery that will knock your socks off! No "canned" graphics... It's ALL YOU! SASE and $1 for budget "DIY" info. Nothing else like it! "LET-R-HED", Adjuntas, PR 00601-0971-Z. Best head width 3".

REPAIRS!
See our full-page ad in this issue!
TRIAD COMPUTERS
1-800-624-6794 or 919-299-0391

MISCELLANEOUS

DIAL-YOUR-MATCH COMMODORE-128 BBS SYSTEM. Easily define 50 questions/3 matchmaking modes/BBS maintains itself AUTOMATICALLY. Full COMMODORE-128 MODE usage/Any number or type of disk drives or hard disk/Use 300 or 1200 baud/40 or 80 column mode/1670-1660-1650-Hayes modem/20 info files, 20 public message boards/Remotely access all SYSOP commands/Have more than one SYSOP/User levels allow restriction so a subscription BBS is possible/Text editor built-in/Accurate time & date/Chat with, dump, or browse caller easily Built-in terminal mode with download!/Call a BBS & download text/Split-Screen viewing of caller's questionnaire/Exchange messages automatically between remote BBSs using DYM-NET/DYM-NET forwarding avoids toll calls/Advanced Technology makes othe BBSs obsolete!/Popularity guaranteed!/Make hundreds of exciting new friends!/Written in BASIC and UNPROTECTED!/Please ORDER BY MODEM 1-818-840-8066 (300 BAUD) or write DYM 128, P.O. BOX 6055, BURBANK, CA 91510

Personal Computer Owners CAN EARN $1000 to $5000 monthly, selling simple services performed by their computer. Work at home - in spare time. Get free list of 100 best services to offer. Write: C.I.L.D.I., P.O. Box 60369, San Diego, CA 92106-8369

PRINTER RIBBONS •Commodore 801/803-$8.75. •Com 1525/1526, Legend 800/880, Banana, Spirit 80-$7.95 •Epson MX/FX/RX 80-$5.25 •Gemini 10/15, Okidata 82,83,92-$2.95 Min. Order: $10. Add $2 S&H Per Order. BOOK KEEPERS, 944-10th, Sidney, NE 69162

COOLING FANS for C64/128 Disk Drives Only $39.95 or $59.95 w/surge protection (See ad, June GAZETTE, p. 120) 414-277-9120. Aier Products, 522 W. Bergen, Milw., WI 53217

BBS CONSTRUCTION KIT - Create your own customized BBS! $51.50. For more info call or write: Powersystems, P.O. Box 822, Coventry, RI 02816 • BBS 401-822-4605

REPAIR: C64 (including p/s)-$45. 1541 (including clean, lube, align)-$50. BUY/SELL: Commodore parts or whole units. CONTACT: Dave Taylor (915) 683-8398 or Jerry Dees (915) 561-8483. 5106 Daventree St., Midland, TX 79705 (parts and labor warranted 30 days)

USE BOTH SIDES OF DISK WITHOUT CUTTING notches. Ideal write protection. Easy no solder kit. Send $7.95 + .50 p/h to: TDE, Box 1482, Windsor, CA 95492-1482

"THE ULTIMATE 64 DISK MENU"
Autoload/run Basic-ML prgs. INSTANTLY restore menu - even during another prog. Remarked Basic & ML on disk w/docs. Send $12 to: Colony SW, POB 4712, Huntsville, AL 35815

COMPUTE!'s Gazette Classified is a low-cost way to tell over 275,000 microcomputer owners about your product or service.

Rates: $25 per line, minimum of four lines. Any or all of the first line set in capital letters at no charge. Add $15 per line for boldface words, or $50 for the entire ad set in boldface (any number of lines.) Inquire about display rates.

Terms: Prepayment is required. Check, money order, American Express, Visa, or MasterCard is accepted. Make checks payable to COMPUTE! Publications.

Form: Ads are subject to publisher's approval and must be either typed or legibly printed. One line equals 40 letters and spaces between words. Please underline words to be set in boldface.

General Information: Advertisers using post office box numbers in their ads must supply permanent address and telephone numbers. Orders will not be acknowledged. Ad will appear in next available issue after receipt.

Closing: 10th of the third month preceding cover date (e.g., June issue closes March 10th). Send order and remittance to: Harry Blair, Classified Manager, COMPUTE!'s Gazette, P.O. Box 5406, Greensboro, NC 27403. To place an ad by phone, call Harry Blair at (919) 275-9809.

Notice: COMPUTE! Publications cannot be responsible for offers or claims of advertisers, but will attempt to screen out misleading or questionable copy.

advertiser's index

Reader Service Number	Advertiser	Page
102	Abacus Software	27,29
103	Abby's Discount Software	110
104	Acorn of Indiana, Inc.	126
105	Activision	15
106	Aprotek	115
107	Aprotek	120
108	Artificial Intelligence Research Group	124
109	Basement Boys Software	21
110	Brady Communications Co., Inc.	11
111	Brantford Educational Services	12
112	Cardinal Software	126
113	Central Point Software	45
	Cheatsheet Products Inc.	125
	C.O.M.B. Direct Marketing Corp.	123
114	Compumed	120
115	CompuServe	IBC
116	ComputAbility	112–113
117	Computer Centers of America	114
118	Computer Mail Order	111
	Covox Inc.	73
	Crown Custom Covers	63
119	CSM Software, Inc.	53
144	Dallas Direct	56
120	Digital Solutions Inc.	BC
121	Digital Solutions Inc.	128
122	Electronic Arts	IFC
123	Electronic One	118
124	Emerald Component International	126
125	Federal Hill Software	120
126	Firstline Software, Inc.	62
127	Free Spirit Software, Inc.	124
128	Future Music	122
	HesWare	53
151	Infocom, Inc.	9
	Intelligent I/O, Inc.	124
129	Little, Brown & Co.	52
	Lyco Computer	24–25
130	Ketek	21
131	Kyan Software	52
132	Marathon Software	118
133	Mastertronic	1
134	Micro Arts Products	35
135	Micro Computer Services	122
136	Micro-W Distributing Inc.	126
137	Powersoft	77
138	Precision Data Products	128
139	Precision Peripherals & Software	35
140	Pro-Tech-Tronics	116
141	Protecto	47–49
142	Schnedler Systems	124
	Second Source Engineering	35
	Simplicity Home Software	128
143	Software Discounters of America	121
145	Strategic Simulations, Inc.	7
146	subLOGIC Corporation	4
	Tektronics Plus, Inc.	63
147	Tenex Computer Express	119
148	Triad Computers	117
149	Tussey Computer Products	18–19
	West Coast Commodore Association, Inc.	73
150	Xetec	14

Item	Page
Classified Ads	127
COMPUTE!'s Gazette Back Issues	109
COMPUTE!'s Gazette Disk Subscription	32
COMPUTE!'s Gazette Subscription	17
First Book of Commodore & Electronic Computer Projects	13
40 Great Flight Simulator Adventures	2
40 More Great Flight Simulator Adventures	3
Machine Language for Beginners & the 2nd Book of Machine Language	31

pd

STATE-OF-THE-ART MAGNETIC MEDIA

5¼" DISKETTES

- With Hub Rings
- Write Protect Tabs
- Envelopes
- User ID Labels
- In Factory Sealed Poly Packs of 10

(YOU GET EVERYTHING BUT THE BOX)

Prices are per Disk

QTY.	50	100	500	1000
SSDD	.59	.56	.52	.49
DSDD	.64	.61	.57	.54

Library Case Holds 15 Diskettes...... Only **$1.00**! plus 50¢ S&H

The 100 File .... Only **$10.95** plus $2.00 S&H

100% ERROR FREE — LIFETIME WARRANTY

Min. order $25.00. Add 10% for less than 50 diskettes. **Shipping and Handling:** $4.00 per 100 diskettes. Reduced shipping for larger quantities. C.O.D. add $4.00. Cash or certified check.

Continental USA VISA C.O.D.

Precision Data Products
P.O. Box 8367, Grand Rapids, MI 49518
(616) 452-3457 • Michigan 1-800-632-2468
Outside Michigan 1-800-258-0028

Commodore SERVICE

★ Normally 48 Hour Turn-Around.
★ *Special* Pla Chip ... $18.95
★ C64 Repair PCB Only. 38.95
★ 1541 Alignment 25.00
★ 1541 Repair 69.95

Parts Included
(Power Supply Extra)

To save C.O.D. charges – send unit and power supply with check or M.O. to:

DIGITAL SOLUTIONS INC.
1122 - 9th St.
Altoona, PA 16601
(814) 944-0405

NEW! from SIMPLICITY HOME SOFTWARE

SIMPLE·WRITER

A SIMPLE LOW COST LINE ORIENTED WORD PROCESSOR FOR THE ENTIRE FAMILY

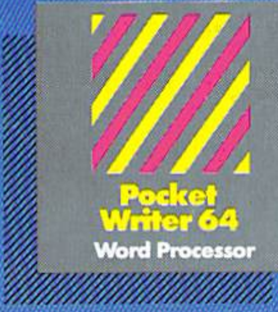
Featuring

- Easy-to-use menu access to all word processor functions (add, move, locate, substitute and more)
- Simple, single key access to your printer's advanced functions (italics, enlarged, superscript, etc.)
- Directives to center or right justify text, control line spacing, control margins and more.
- Configured for popular printers and customizable to all printers.
- Simple but powerful menu driven form control sets margins, print fonts, page size, line width, page numbering and more.

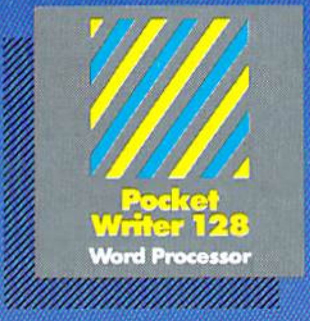
SEND $10.95 (+1.25 for postage and handling) TO

SIMPLICITY - HOME SOFTWARE
P.O. Box 1194
Hillsboro, OR 97123
1-503-640-1465

Solutions!



PW 128/64 Dictionary
also available at $14.95 (U.S.)

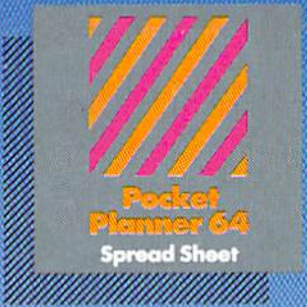


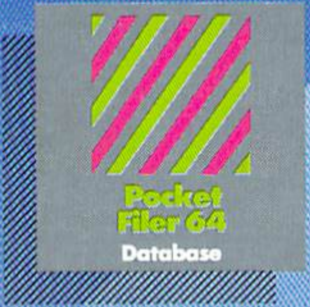
MAIL ORDERS:

CRYSTAL COMPUTER INC.
In Michigan 1-517-224-7667
Outside Michigan 1-800-245-7316

CANADIAN DEALER ENQUIRIES

INGRAM CANADA LTD.
1-416-738-1700





Pocket
Filer 128
Database

Only The Name Is New

The professional, full-featured software line from Digital Solutions is now called Pocket Software.
Pocket Writer 128/64.
Pocket Filer 128/64.
Pocket Planner 128/64.
The names are new, but this super software is still the same.

From now on, when you hear the word Pocket, it means software that's full-featured, handy and easy to use.

Pocket Software at prices that won't pick your pocket.

Pocket
Planner 128
Spread Sheet

Best-selling software for Your Commodore 128 or 64

You want the very best software you can find for your Commodore 128 or 64, right?

You want integrated software — word processing, database and spreadsheet applications — at a sensible price. But, you also want top-of-the-line features. Well, our Pocket 128/64 software goes one better.

With Pocket 128 or 64, you'll find all the features you can imagine . . . and then some. And Pocket 128/64 is so easy to use, you won't even need the reference guide. On-screen and in memory instructions will have you up and running in less than 30 minutes, even if you've never used a computer before.

The price? It's as low as you'd expect for a line of software called 'Pocket'. Suggested Retail Price for the 64 software is $39.95 (U.S.) and $49.95 (U.S.) for the 128. Any of the 64 products may be upgraded to their 128 version for $15.00 (U.S.) + $3.00 shipping and handling. (Available to registered owners from Digital Solutions Inc. only.)

Pocket Writer 128 or 64, Pocket Planner 128 or 64 and Pocket Filer 128 or 64 . . . **Solutions** at sensible prices from Digital Solutions Inc.

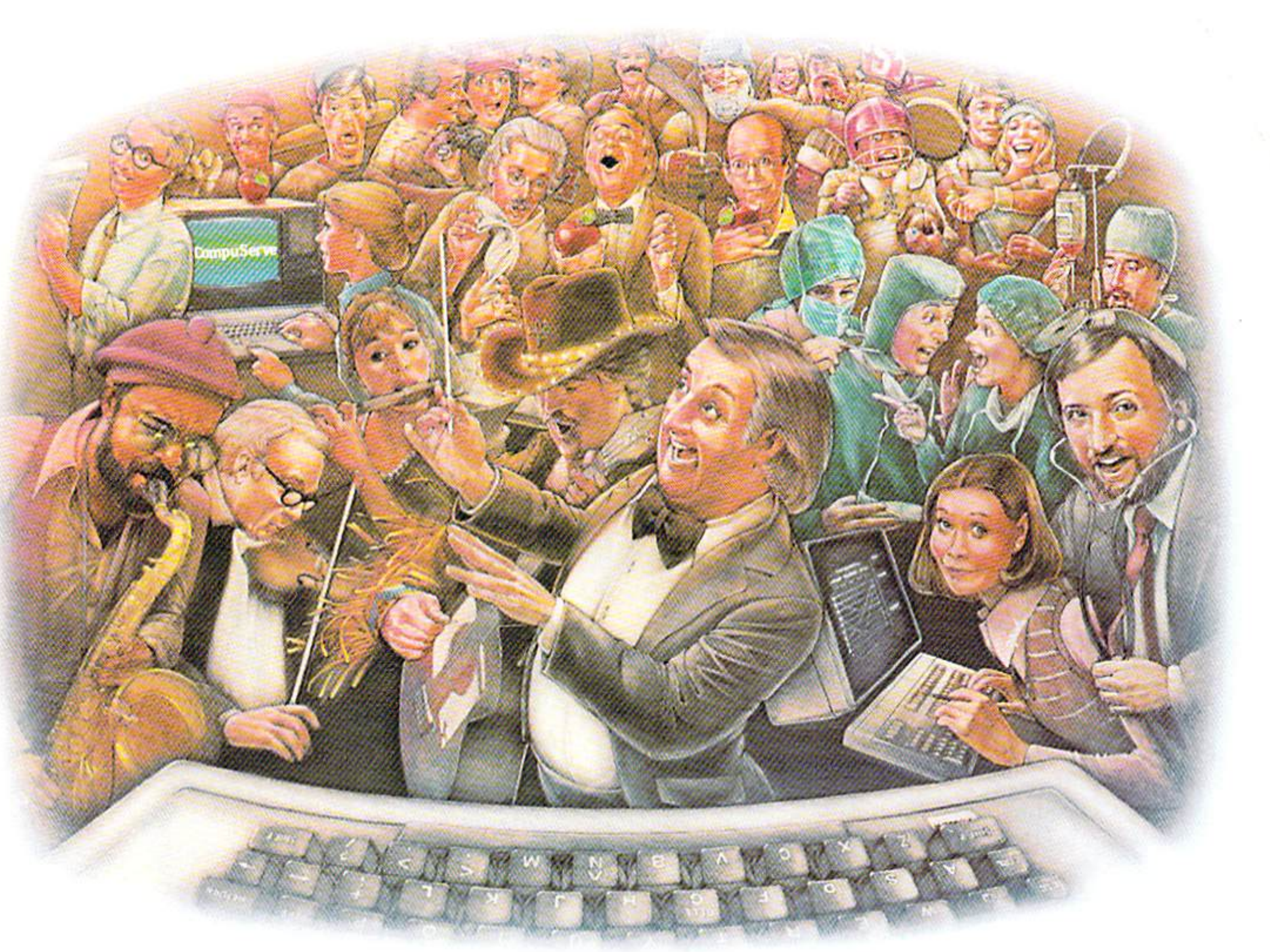
International & Distributor enquiries to:

Serious software that's simple to use.

**Digital
Solutions
Inc.**

30 Wertheim Court, Unit 2
Richmond Hill, Ontario
Canada L4B 1B9
telephone (416) 731-8775

Pocket Writer 128 and 64 are now available in French.



HOW PEOPLE WITH COMMON INTERESTS FIND AN INTERESTING COMMON GROUND.

Presenting CompuServe Forums. Where people from all over get together, without even leaving home.

Now thanks to CompuServe Forums, computer owners are sharing common interests by talking to each other through their computer keyboards. ***Software users, computer enthusiasts, ham operators, french cooks, fire fighters, science fiction lovers and other special interest groups*** are already in touch, online.

Because when you subscribe to CompuServe, you're able to reach people who want to talk about the things you do. As many people as you like. For as long as you like. Whenever you wish.

Join a conversation already in progress or start one on your own. Ask questions. And get answers.

All it takes is a modem, most any personal computer and CompuServe.

Forum members across the country are as close as a local phone call.

You can go online with just a local call in most major metropolitan areas. And normal usage fees for weekday nights and weekends are just 10¢ a minute.

Of special interest to all Forum participants is software that's FREE for the taking.

Public domain software. For all sorts of activities, from games to business programs. And it's just as easy to copy a piece of software as it is to participate in a Forum.

Become a CompuServe subscriber and get a $25 Usage Credit to start you off.

Becoming a subscriber is as easy as contacting your local computer dealer. Or you can call us and order direct. Suggested retail price is $39.95.

And if you'd want more information about CompuServe, we'll be happy to send you a free brochure. Because with all that CompuServe offers—we think it's in your best interest.

CompuServe®

Information Services, P.O. Box 20212,
5000 Arlington Centre Blvd., Columbus, OH 43220
800-848-8199
In Ohio, call 614-457-0802

An H&R Block Company